Permit Fact Sheet

General Information

Permit Number:	WI-0001589-09-0
Permittee Name:	Wisconsin Power and Light - Edgewater Generating Station
Address:	3739 Lakeshore Drive
City/State/Zip:	Sheboygan, WI 53081-7233
Discharge Location:	The facility is located on the west shore of Lake Michigan on the southern side of Sheboygan. The primary Outfalls 004 (process wastewater treatment ponds) and 009 (Unit 5 condenser cooling water) are located on shore. **Outfall 004**: Lake Michigan shoreline 0.24 miles north of the Black River - 87° 42’ 13.08’’ N, 43° 42’ 36.84’’ W **Outfall 009**: Lake Michigan shoreline 0.68 miles north of the Black River - 87° 42’ 19.56’’N 43° 42’ 58.56’’ W
Receiving Water:	Lake Michigan and roadside ditch to Black River located in the Black River Watershed in the Sheboygan River Basin.
Streamflow ($Q_{7,10}$):	Not applicable because Lake Michigan is the main receiving water and Black River has no defined flow.
Stream Classification:	The purpose of water quality standards are to protect the designated uses of waterbodies receiving pollutants from effluents. The designated uses for the Black River are listed in s. NR 104.24(2), Wis. Adm. Code and include fishing, recreation, aesthetic, and stock and wildlife watering. The water quality shall meet the requirements and standards for recreation and fish and aquatic life. The Black River is classified as a warm water sport fishery. The uses for Lake Michigan are listed in s. NR 104.25, Wis. Adm. Code and include recreation, commercial and recreational fishing, shipping, public water supply, waste assimilation, and industrial cooling water. In addition, the Lake Michigan in the vicinity of EDG is classified as a trout water in s. NR 104.26, Wis. Adm. Code. Lake Michigan is classified as a cold water community and public water supply.

Facility Description

Wisconsin Power and Light – Edgewater Generation Station (EDG), operates a steam electric generating plant located on the western shore of Lake Michigan just south of Sheboygan, Wisconsin. The plant has one generating unit (Unit 5) which uses subbituminous coal as the fuel source and has a nameplate capacity of 380 megawatts (MW) of electricity. The plant discharges wastewater to Lake Michigan at multiple locations, designated as Outfalls 002, 004, 009, 010, and 012. There is also a sporadic discharge from a secondary containment area which may occur following a storm event. The discharge from the secondary containment area (Outfall 014) is directed to a roadside ditch which ultimately discharges to the Black River.

Facility Changes for Compliance with Coal Combustion Residual (CCR) Rule

The permittee submitted an engineering report dated April 12, 2019 describing proposed changes to the facility's operations as it plans to dewater and close its existing coal combustion residual ponds. As a result of the pond closures, low volume wastewater (LVWW) currently sent to the ponds and discharged through Outfall 004 will need to be redirected. The plan is to reuse LVWW as makeup water in the facility's Unit 5 Air Quality Control System (AQCS) Scrubber. During most operations, it's expected that all LVWW will be used and consumed in the scrubber, and therefore not require a discharge. However, there are operational periods when an option for discharge must be available for the LVWW. If needed, LVWW will discharge to the service water return (SWR) line and discharged through Outfall 009, not Outfall 004 as done previously.

Low Volume Wastewater (LVWW) Discharge Changes

There are five operating scenarios which affect the flow routing of LVWW and are described below.

1. **Normal Load**: Under this operating scenario, LVWW is acceptable for scrubber use and 100% of LVWW will be sent to the scrubber. The blow-off tank water will be directed to the SWR Outfall 009.

2. **Low Load**: Under this operating scenario, LVWW is acceptable for scrubber use but scrubber demand is less than LVWW capacity (excess LVWW). In this case, LVWW will be split, with some LVWW going to satisfy the scrubber demand and the excess discharged to SWR Outfall 009. The blow-off tank water will be directed to the SWR Outfall 009.

3. **High Load**: Under this operating scenario, LVWW is acceptable for scrubber but scrubber demand is greater than LVWW capacity (LVWW deficit). In this case, 100% of LVWW will be sent to scrubber and blow-off tank water will also be sent to the scrubber instead of being discharged to SWR Outfall 009.

4. **Polisher Regeneration**: Under this operating scenario, LVWW is acceptable for scrubber use but condensate polisher regeneration, which occurs ~2x/week, does not meet makeup water specifications for the scrubber. Therefore, the condensate polisher regeneration wastewaters will receive pH neutralization and sulfate dilution in one of the WPDES surge tanks, while other LVWW is held in the other WPDES surge tank. If sulfate levels for the scrubber are met, then 100% of LVWW will be sent to the scrubber. The blow-off tank water will be directed to the SWR Outfall 009.

5. **Post Polisher Regeneration**: This operating scenario is similar to the polisher regeneration described in #4, however in this case, sulfate concentrations do not meet the specifications for scrubber use and therefore all LVWW is diverted to discharge to SWR Outfall 009. The blow-off tank water is also directed to the SWR Outfall 009.

Sampling Points Added Due to Piping Modifications

The following sampling points were added to the permit resulting from the LVWW piping modifications: 103, 104, 105, 106, 107, and 108.

Sample Point Designation		
Sample Point Number	**Discharge Flow, Units, and Averaging Period**	**Sample Point Location, WasteType/sample Contents and Treatment Description (as applicable)**
709	The average intake flow was 163.7 MGD (253.3 cfs) for the last five years over the period from January 1, 2010 to October 31, 2015 as identified in the permit reissuance application.	Two velocity cap intakes used for Unit 5.
702	The intake is now used as a back up and is estimated to withdraw 3,750 gpm (5.4 MGD) if utilized.	Intake for retired Units 3 and 4 used as emergency intake for Unit 5.
101	Not applicable	Collect field blank using standard sample handling procedures.
103	New sample point, data not yet available. Estimated average is 52 gpm (0.075 MGD).	Unit 5 continuous boiler blowdown minus service water contribution. Mass results at SP105 (Service Water) are subtracted from mass results at SP106 (Boiler Blowdown + Service Water) to assess compliance with ELGs for boiler blowdown at SP103.
104	Average is 0.018 MGD taken from contributing sources to Outfall 004 in permit application. Flow is anticipated to be reduced once LVWW is discharged through Outfall 009.	Sampling of coal pile runoff at pumphouse from Pond E to Pond F prior to mixing with other process wastewaters discharged through Outfall 004.
105	New sample point, data not yet available. Estimated average is 304 gpm (0.438 MGD) and estimated max is 346 gpm (0.498 MGD).	Sampling of service water sourced from Lake Michigan prior to quenching boiler blowdown. Samples shall be collected at the grab sample port on the service water supply pipe going to the boiler blowdown tank.
106	New sample point, data not yet available. Estimated average is 356 gpm (0.513 MGD) and estimated max is 398 gpm (0.573 MGD)	Sampling of boiler blowdown and service water mixture shall be collected at the isolated Unit 5 boiler blow off sump discharge header sampling port. Samples shall be collected prior to discharging to the service water return header (condenser discharge) during low load, normal load, and polisher regeneration operations.
107	New sample point, data not yet available. Estimated average is 200 gpm (0.288 MGD). Estimated max is 600 gpm (0.864 MGD).	Sampling of low volume wastewater (LVWW) not including boiler blowdown. Samples shall be collected from the composite sampler on the purge line that diverts LVWW from being reused in the Unit 5 AQCS and then discharged to the service water return header and ultimately through Outfall 009.
108	New sample point, data not yet available. Average Unit 5 non-contact cooling water was 166 MGD taken from contributing	Once through cooling water shall be sampled prior to any LVWW mixing and discharge through Outfall 009.

Sample Point Designation		
Sample Point Number	**Discharge Flow, Units, and Averaging Period**	**Sample Point Location, WasteType/sample Contents and Treatment Description (as applicable)**
	sources to Outfall 009 in permit reissuance application.	
002	Sample point has been repurposed and therefore relevant data is not yet available. Before Unit 3 and 4 retired, the discharge max annual average was 118.6 MGD. Value taken from permit reissuance application.	This outfall is for the discharge of non-contact service water withdrawn from Lake Michigan using emergency intake Sampling Point 702. The intake water is used to verify the emergency intake system is functional. It is anticipated that the intake pumps will run for ~20-60 minutes on a monthly basis. Intake water will not come in contact or be associated with any process. This outfall was previously used to monitor the discharge of NCCW and boiler blowdown for Units 3 and 4, which are now retired.
004	Max annual average during previous permit term was 8.6 MGD in 2014. Value taken from permit reissuance application.	This outfall is for the discharge of process wastewater, stormwater, ion exchange demineralization regeneration, and coal pile runoff. Once the coal combustion residual (CCR) ponds are abandoned, only stormwater and coal pile runoff while be discharged.
009	Max annual average during previous permit term was 174.25 MGD in 2015. Value taken from permit reissuance application.	Unit 5 once-through condenser cooling water and service water discharged to Lake Michigan. The discharge may occasionally contain low volume wastewaters (LVWW) if the LVWW cannot be reused in the Unit 5 Air Quality Control System (AQCS) scrubber.
010	Max annual average during previous permit term was 20.59 MGD in 2015. Value taken from permit reissuance application.	Recycling of Unit 5 condenser cooling water to deice the Lake Michigan water intake structure.
012	Max annual average during previous permit term was 0.213 MGD in 2017. Value taken from permit reissuance application.	Fish return trough from Unit 5 traveling water screen.
014	There was no discharge from Outfall 014 during the previous permit term. Historic max annual average was 2,869 GPD in 2006.	Storm water within oil storage tank secondary containment berm and effluent from the oil/water separator from the fuel oil pump house, discharges to a ditch that eventually joins the Black River.

1 Influent – Cooling Water Intake Structure - Proposed Monitoring

1.2.1 Sample Point Number: 709- Unit 5 Intake

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Intake Water Used Exclusively For Cooling		% Flow	Daily	Continuous	
Mercury, Total Recoverable		ng/L	Quarterly	Grab	
Arsenic, Total Recoverable		ug/L	Monthly	Grab	Collect Sampling Point 709 arsenic sample on same day as Outfall 009 arsenic sample.
pH Field		su	Weekly	Grab	Collect Sampling Point 709 pH sample on same day as Outfall 009 pH sample.

1.2.2 Sample Point Number: 702- Emergency Intake

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Per Occurrence	Continuous	
Intake Water Used Exclusively For Cooling		% Flow	Per Occurrence	Continuous	

Explanation of Changes to Limits and Monitoring Requirements

All requirements for cooling water intakes have been added. Added arsenic sampling. Both mercury, arsenic, and pH sampling are included to determine Lake Michigan contribution to permittee's discharges. See Attachment 2: 316(b) Cooling Water Intake Structure (CWIS) Evaluation for detailed information.

2 In-Plant - Proposed Monitoring and Limitations

2.2.1 Sample Point Number: 101- Mercury Field Blank

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Mercury, Total Recoverable		ng/L	Quarterly	Blank	

2.2.2 Sample Point Number: 103- Unit 5 Boiler Blowdown

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Suspended Solids, Total	Daily Max	63 lbs/day	Quarterly	Calculated	
Suspended Solids, Total	Monthly Avg	19 lbs/day	Quarterly	Calculated	
Oil & Grease (Hexane)	Daily Max	13 lbs/day	Quarterly	Calculated	
Oil & Grease (Hexane)	Monthly Avg	9.4 lbs/day	Quarterly	Calculated	

2.2.3 Sample Point Number: 104- Coal Pile Runoff

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Quarterly	Estimated	
Suspended Solids, Total	Daily Max	50 mg/L	Quarterly	Grab	

2.2.4 Sample Point Number: 105- Service Water for Blowdown

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Total Daily	
Suspended Solids, Total		mg/L	Quarterly	Grab	
Oil & Grease (Hexane)		mg/L	Quarterly	Grab	

2.2.5 Sample Point Number: 106- Boiler Blowdown + Serv Water

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Total Daily	
Suspended Solids, Total		mg/L	Quarterly	Grab	
Oil & Grease (Hexane)		mg/L	Quarterly	Grab	

2.2.6 Sample Point Number: 107- Low Volume Wastewater

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Total Daily	Sampling only required when unit is operating or if pumps are on.
Suspended Solids, Total	Daily Max	100 mg/L	Quarterly	24-Hr Comp	Sampling only required when unit is operating or if pumps are on.
Suspended Solids, Total	Monthly Avg	30 mg/L	Quarterly	24-Hr Comp	Sampling only required when unit is operating or if pumps are on.
Oil & Grease (Hexane)	Daily Max	20 mg/L	Quarterly	Grab	Sampling only required when unit is operating or if pumps are on.
Oil & Grease (Hexane)	Monthly Avg	15 mg/L	Quarterly	Grab	Sampling only required when unit is operating or if pumps are on.

2.2.7 Sample Point Number: 108- Unit 5 Cooling Water

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Total Daily	
Chlorine, Total Residual	Daily Max	0.2 mg/L	Per Occurrence	Grab	
Chlorine, Total Resdl Discharge Time	Daily Max	2.0 hours	Per Occurrence	Calculated	

Explanation of Changes to Limits and Monitoring Requirements

Mercury field blank required for mercury sampling quality control purposes. All other in-plant sampling points are for determining ELG compliance. See Attachment 3: Effluent Limit Guidelines (ELG) and Technology Based Effluent Limits (TBEL).

3 Surface Water - Proposed Monitoring and Limitations

3.2.1 Sample Point Number: 002- Emergency Intake Testing

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Per Occurrence	Total Daily	

Explanation of Changes to Limits and Monitoring Requirements

Outfall 002 is no longer for the discharge of Unit 3 and 4 cooling water since those units are retired. Outfall 002 is now for testing the emergency intake. Permit sampling frequency and type changed to reflect changed operation.

3.2.2 Sample Point Number: 004- Process Wastewater

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Total Daily	
Oil & Grease (Hexane)	Daily Max	14 mg/L	2/Month	Grab	
Oil & Grease (Hexane)	Monthly Avg	11 mg/L	2/Month	Grab	
Suspended Solids, Total	Daily Max	82 mg/L	Weekly	24-Hr Comp	
Suspended Solids, Total	Monthly Avg	30 mg/L	Weekly	24-Hr Comp	
pH (Maximum)	Daily Max	9.0 su	Weekly	Grab	
pH (Minimum)	Daily Min	6.0 su	Weekly	Grab	
Phosphorus, Total	Monthly Avg	0.6 mg/L	Quarterly	24-Hr Comp	
Iron, Total Recoverable	Daily Max	1.0 mg/L	Monthly	24-Hr Comp	
Iron, Total Recoverable	Monthly Avg	1.0 mg/L	Monthly	24-Hr Comp	
Mercury, Total Recoverable	Daily Max	7.3 ng/L	Quarterly	Grab	
Arsenic, Total Recoverable	Daily Max	5.1 ug/L	Monthly	24-Hr Comp	This is an interim effluent limit. See section 3.2.2.2 and 4.2
Zinc, Total Recoverable		ug/L	Monthly	24-Hr Comp	
Copper, Total Recoverable	Daily Max	1.0 mg/L	Monthly	24-Hr Comp	
Copper, Total Recoverable	Monthly Avg	1.0 mg/L	Monthly	24-Hr Comp	

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Acute WET		TUa	See Listed Qtr(s)	24-Hr Comp	
Chronic WET		TUc	See Listed Qtr(s)	24-Hr Comp	

Explanation of Changes to Limits and Monitoring Requirements

Outfall 004 phosphorus limit changed to 0.6 mg/L. Iron sampling frequency reduced to match other metals monitoring frequencies. Added Condition 1.2.2.6 for increased monitoring frequency of certain parameters during the CCR pond dewatering project in response to EPA comments on the permit. Mercury limit added to permit. Arsenic variance limit added to permit. See Attachment 4: Water Quality Based Effluent Limits (WQBEL), Attachment 5: Mercury Mixing Zone Phase Out, Attachment 6: Temperature Alternative Effluent Limitation (AEL), and Attachment 7: Arsenic Variance. The previous permit included notes stating "Sampling frequency shall be daily during periods of air heat and precipitator washes." This note is removed since EDG converted to a dry ash handling system.

3.2.3 Sample Point Number: 009- Unit 5 Cooling Water

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	Sampling only required when unit is operating or if pumps are on.
Temperature Maximum		deg F	Daily	Continuous	Sampling only required when unit is operating or if pumps are on.
Copper, Total Recoverable	Daily Max	0.042 mg/L	Monthly	Grab	Limit effective October 1, 2024. See compliance schedule. Sampling only required when unit is operating or if pumps are on.
Copper, Total Recoverable	Monthly Avg	0.042 mg/L	Monthly	Grab	Limit effective October 1, 2024. See compliance schedule. Sampling only required when unit is operating or if pumps are on.
Copper, Total Recoverable	Monthly Avg	70 lbs/day	Monthly	Calculated	Limit effective October 1, 2024. See compliance schedule. Sampling only

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
					required when unit is operating or if pumps are on.
Mercury, Total Recoverable	Daily Max	7.3 ng/L	Quarterly	Grab	Sampling only required when unit is operating or if pumps are on.
Arsenic, Total Recoverable	Daily Max	2.5 ug/L	Monthly	Grab	Sampling only required when unit is operating or if pumps are on. This is an interim effluent limit. See section 3.2.3.2 and 4.2. Collect Outfall 009 arsenic sample on same day as Sampling Point 709 arsenic sample. See section 3.2.3.6.
pH (Maximum)	Daily Max	9.0 su	Weekly	Grab	Sampling only required when unit is operating or if pumps are on. Collect Outfall 009 pH sample on same day as Sampling Point 709 pH sample. See section 3.2.3.7.
pH (Minimum)	Daily Min	6.0 su	Weekly	Grab	Sampling only required when unit is operating or if pumps are on. Collect Outfall 009 pH sample on same day as Sampling Point 709 pH sample. See section 3.2.3.7.

Explanation of Changes to Limits and Monitoring Requirements

Outfall 009 now has copper, mercury, arsenic, and pH limits. WET testing historically not required at Outfall 009 because the discharge is primarily Lake Michigan water used for cooling. Due to the infrequent discharge of LVWW through Outfall 009 and the low volume of LVWW compared to condenser cooling water, WET testing is not required at Outfall 009. Arsenic data for Outfall 009 does not exist so the department set the interim arsenic limit using a mass balance approach as described below:

Outfall 009 Flow: **201 MGD** which is based on the peak daily flow at Outfall 009 from January 2013 to March 2019.

Outfall 009 Arsenic Concentration: **2.2 ug/L** which is based on the highest measured arsenic value at both Unit 4 and 5 surface water intakes from 2012-present.

Outfall 004 Flow: **19.6 MGD** which is based on the peak daily flow at Outfall 004 from January 2013 to March 2019.

Outfall 004 Arsenic Concentration: **5.1 ug/L** which is the 1-day P99 for Outfall 004.

(Outfall 009 Flow)(Outfall 009 Arsenic) + (Outfall 004 Flow)(Outfall 004 Arsenic) = (Total Flow)(Arsenic Limit)
(201 MGD)(2.2 ug/L) + (19.6 MGD)(5.1 ug/L) = (220.6 MGD)(Arsenic Limit)
This results in a limit of **2.5 ug/L**.
The department added condition 3.2.3.6 and 3.2.3.7 because Lake Michigan background conditions have the potential to exceed the permitted limits for arsenic and pH. See Attachment 4: Water Quality Based Effluent Limits (WQBEL), Attachment 5: Mercury Mixing Zone Phase Out, Attachment 6: Temperature Alternative Effluent Limitation (AEL), and Attachment 7: Arsenic Variance.

3.2.4 Sample Point Number: 010- Unit 5 Water Intake Deicing

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Monthly	Estimated	

Explanation of Changes to Limits and Monitoring Requirements

No changes.

3.2.5 Sample Point Number: 012- Fish Return Trough

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Monthly	Estimated	

Explanation of Changes to Limits and Monitoring Requirements

No changes.

3.2.6 Sample Point Number: 014- Oil Tank Secondary Containment

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Annual	Estimated	Sample during discharge.
Oil & Grease (Hexane)	Daily Max	15 mg/L	Annual	Grab	Sample during discharge.
BETX, Total		mg/L	Annual	Grab	Sample during discharge. Total BETX shall include a summation of benzene, ehtylbenzene, toluene, total xylenes.

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
PAHs		ug/L	Annual	Grab	Sample during discharge. See note below.

Explanation of Changes to Limits and Monitoring Requirements

No changes.

4 Schedules

4.1 Mercury Pollutant Minimization Program

As a condition of the mixing zone phase out exception for mercury granted in accordance with s. NR 106.06(2)(br), Wis. Adm. Code, the permittee shall perform the following actions.

Required Action	Due Date
Annual Mercury Status Reports: The permittee shall submit to the Department an annual status report which summarizes and evaluates mercury monitoring data and other relevant information collected to document background and effluent mercury levels. The report shall also document any continuing reasonable cost-effective efforts to identify and reduce potential sources of mercury in the effluent. The first annual mercury progress report is to be submitted by the Due Date.	01/31/2021
Annual Mercury Status Report #2: Submit a mercury progress report as defined above.	01/31/2022
Annual Mercury Status Report #3: Submit a mercury progress report as defined above.	01/31/2023
Annual Mercury Status Report #4: Submit a mercury progress report as defined above.	01/31/2024
Final Mercury Report: Submit a final report documenting the success in reducing or maintain mercury concentrations in the effluent. The report shall summarize mercury pollutant minimization activities that have been implemented during the current permit term. The report shall include an analysis of trends in monthly and annual total effluent mercury concentrations based on mercury sampling during the current permit term. The report shall also include an analysis of how influent and effluent mercury varies with time and with facility activities. If the permittee intends to reapply for a mercury mixing zone phase out exception per s. NR 106.06(2)(br), Wis. Adm. Code, for the reissued permit, that application is due with the application for permit reissuance. The permittee should submit or reference the PMP plan as updated by the Annual Status Reports or more recent developments as part of that application.	01/01/2025
Annual Mercury Reports After Permit Expiration: In the event that this permit is not reissued on time, the permittee shall continue to submit annual mercury status reports.	

4.2 Arsenic Pollutant Minimization Program

As a condition of the variance to the water quality based effluent limitation granted for arsenic in accordance with s. 283.15, Wis. Stats., the permittee shall perform the following actions.

Required Action	Due Date
Annual Arsenic Progress Reports: Submit an annual arsenic progress report. The annual arsenic progress report shall: Indicate which arsenic pollutant minimization activities or activities outlined in the approved Pollutant Minimization Plan have been implemented; Include an analysis of trends in monthly and annual total effluent arsenic concentrations based on arsenic sampling; and Include an analysis of how influent and effluent arsenic varies with time and with significant loading of arsenic such as loads from facility activities. The first annual arsenic progress report is to be submitted by the Due Date.	01/31/2021
Annual Arsenic Progress Report #2: Submit an arsenic progress report as defined above.	01/31/2022
Annual Arsenic Progress Report #3: Submit an arsenic progress report as defined above.	01/31/2023
Annual Arsenic Progress Report #4: Submit an arsenic progress report as defined above.	01/31/2024
Final Arsenic Report: Submit a final report documenting the success in reducing arsenic concentrations in the effluent, as well as the anticipated future reduction in arsenic sources and arsenic effluent concentrations. The report shall summarize arsenic pollutant minimization activities that have been implemented during the current permit term and state which, if any, pollutant minimization activities from the approved pollutant minimization plan were not pursued and why. The report shall include an analysis of trends in monthly and annual total effluent arsenic concentrations based on arsenic sampling during the current permit term. The report shall also include an analysis of how influent and effluent arsenic varies with time and with significant loading of arsenic from facility activities. If the permittee intends to reapply for a arsenic variance per s. 283.15, Wis. Stats., for the reissued permit, a detailed pollutant minimization plan outlining the pollutant minimization activities proposed for the upcoming permit term shall be submitted along with the final report.	01/01/2025
Annual Arsenic Reports After Permit Expiration: In the event that this permit is not reissued on time, the permittee shall continue to submit annual arsenic reports each year covering pollutant minimization activities implemented and arsenic concentration trends.	

4.3 Copper Schedule

This compliance schedule requires the permittee to achieve compliance by the specified date

Required Action	Due Date
Report on Effluent Discharges: Submit a report on effluent discharges of copper with conclusions regarding compliance.	09/30/2021
Action Plan: Submit an action plan for complying with the effluent limitation. If construction is required, include plans and specifications with the submittal.	09/30/2022
Initiate Actions: Initiate actions identified in the plan.	09/30/2023
Complete Actions: Complete actions necessary to achieve compliance with the effluent limitations.	09/30/2024

4.4 CWIS Annual Certification Statement

Submit an annual certification statement as required by section 1.3.5.1 of the permit.

Required Action	Due Date

Submit CWIS Annual Certification Statement: Submit an annual certification statement as required by section 1.3.5.1 of the permit.	01/31/2021
Submit CWIS Annual Certification Statement: Submit an annual certification statement as required by section 1.3.5.1 of the permit.	01/31/2022
Submit CWIS Annual Certification Statement: Submit an annual certification statement as required by section 1.3.5.1 of the permit.	01/31/2023
Submit CWIS Annual Certification Statement: Submit an annual certification statement as required by section 1.3.5.1 of the permit.	01/31/2024
Submit CWIS Annual Certification Statement: Submit an annual certification statement as required by section 1.3.5.1 of the permit.	01/31/2025

Explanation of Schedules

PMP for mercury is required by s. NR 106.06(2)(br)3.d., Wis. Adm. Code as part of the mercury mixing zone phase out exception. PMP for arsenic is required by s. 283.15(5)(c)2., Wis. Stats. as a condition of the variance. This is the initial imposition of a copper limit at Outfall 009. A compliance schedule for copper is granted in accordance with s. NR 106.117, Wis. Adm. Code. CWIS annual certification statement is required pursuant to 40 CFR 125.97(c). Schedule is coded in permit to track submittal of certification statement.

Attachments

Attachment 1: Substantial Compliance Determination
Attachment 2: 316(b) Cooling Water Intake Structure (CWIS) Evaluation
Attachment 3: Effluent Limit Guidelines (ELG) and Technology Based Effluent Limits (TBEL)
Attachment 4: Water Quality Based Effluent Limits (WQBEL)
Attachment 5: Mercury Mixing Zone Phase Out Exception
Attachment 6: Temperature Alternative Effluent Limitation (AEL)
Attachment 7: Arsenic Variance
Attachment 8: Water Flow Schematic(s)
Attachment 9: Maps(s)
Attachment 10: Public Notice
Attachment 11: EPA Arsenic Variance Data Sheet

Proposed Expiration Date

September 30, 2025

Prepared By: Ian Hansen, Wastewater Engineer - Water Quality Bureau

Date: April 20, 2020

Attachment 1: Substantial Compliance Determination

Substantial Compliance Determination

Permittee Name: Wisconsin Power and Light Edgewater Gen. Sta		Permit Number: 0001589-09-0
	Compliance?	Comments
Discharge Limits	Yes	Alliant has maintained compliance with their WPDES permit limits. No significant exceedences noted.
Sampling/testing requirements	Yes	Alliant has performed all of their sampling and testing requirements completely and on time.
Groundwater standards	NA	
Reporting requirements	Yes	All reports are submitted complete and on time.
Compliance schedules	Yes	Alliant is current on all of their compliance schedules. Continuing to ID sources of Hg in their system if possible by implementing their Hg PMP. IP sampling along with velocity caps showed compliance with 316b. They have applied for an Arsenic variance for the upcoming permit which stays their comp sched for arsenic. They have completed their temperature limits comp sched. They already meet the limits.
Management plan	NA	
Other:	NA	
Enforcement Considerations	None	
In substantial compliance?	Yes Comments: Alliant Energy Edgewater is a well run facility and all WPDES activities are well documented. This facility is in substantial compliance with their WPDES permit. Signature: Curt Nickels Date: 11/07/2017 Concurrence: Date:	

Attachment 2: 316(b) Cooling Water Intake Structure (CWIS) Evaluation

I. INTERIM BTA EVALUATION

The permittee requested an alternative schedule which was granted by the department, so the department is doing an interim BTA this permit reissuance. The Department has updated the permit to address the requirements of 40 CFR 125 Subpart J. Requirements for surface water intakes for previously used Units 3 and 4 (now for emergency use only) are included under Sample Point 702. Intake requirements for Unit 5 are included under Sample Point 709. Unit 3 and Unit 4 retired in 2013 and 2015 respectively. Intake 702 will only be used for Unit 5 for emergency purposes. Therefore, this review is for the design and operation of intake structures 709 and 702 for Unit 5 with intake structure 702 restricted to emergency scenarios. These are intakes at an existing facility. The construction of electric generating Unit 5 dates back to 1985. There have been no changes to Unit 5 that are considered modifications in terms the "existing facility" definition contained in 40 CFR 125.92(k).

The department used the following reports in its interim BTA determination:

- Section 316(b) Compliance Feasibility Study for the Edgewater Generating Station (July 2005)
- Section 316(b) Proposal for Information Collection for the Edgewater Generating Station (August 2005)
- Section 316(b) Impingement Mortality and Entrainment Characterization Study for the Edgewater Generating Station (April 2007)
- Section 316(b) 40 CFR 122.21(r) Information for the Edgewater Generating Station (November 2007)
- Letter dated July 20, 2009 from Burns & McDonnel to Alliant Energy regarding 2009 entrainment characterization study
- Letter dated February 19, 2016 from Alliant Energy to Curt Nickels responding to condition approval of ichthyoplankton sampling. Includes February 17, 2016 Plan for Ichthyoplankton and Entrainment Sampling at the Wisconsin Power and Light Edgewater Generating Station
- Letter dated June 18, 2018 from Alliant to Keith Pierce with subject June and July 2016/2017 Entrainment Sampling at the Wisconsin Power and Light Company ("WPL") – Edgewater Generating Station

II. COOLING WATER INTAKE STRUCTURE 709 DESCRIPTION

Sampling Point 709 - Unit 5 Intake

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limits and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	
Intake Water Used		% Flow	Daily	Continuous	

Exclusively For Cooling					

Cooling Water Intake Structure (CWIS) 709 for Unit 5: The Influent section of the permit includes the CWIS authorization for use and interim BTA (Best Technology Available) determination. The permittee is authorized to use the cooling water intake structure 709 which consists of the following:

Location: Intake 709 is located 1,500 ft off the western shore of Lake Michigan in Sheboygan County in eastern Wisconsin. (exact location of the intake is not disclosed for security purposes).

Source Waterbody Information: Intake 709 withdraws water from Lake Michigan. Lake Michigan has a surface area of 22,300 square miles and maximum and average depths of 925 and 279 feet, respectively. The lake holds 1,180 cubic miles of water, which represents about 22 percent of all the water in the Great Lakes system. Near the facility, water depth increases at a gradual rate from the shoreline. The substrate is primarily sand with occasional rock outcrops. The substrate is not particularly conducive for the growth of aquatic macrophytes. Instead, filamentous algae take advantage of the increased water clarity and grow on the bottom of the lake. Under certain wind conditions, the algae will break loose from the bottom and wash ashore in nuisance quantities.

General Description: Intake 709 withdraws water through two, 36-foot diameter, 5-foot high, submerged velocity caps located 1,500 feet offshore. The velocity caps have 64 screen panels, with each panel having an area of 16.3 ft^2 and 74% percent of the area open.

Major Components: The Unit 5 intake withdraws water through two, 36-foot diameter, 5-foot high, submerged velocity caps located 1,500 feet offshore. These caps have 3/8-inch mesh screen panels around their perimeters. These screens do not have automated cleaning systems and often become plugged with algae. If plugged, the screens are designed to fold in if the pressure on the screens exceeds a threshold. When collapsed, the screens do not provide impingement protection until divers clean and restore the screens on the velocity cap. Water from the velocity caps is piped to an onshore pump house that contains (as backup to the velocity caps) three, 7-foot wide, 27-foot high, 3/8-inch mesh traveling screens with a clean through-screen velocity of 2.97 fps. The traveling screens at the Unit 5 pump house have low pressure sprays to remove fish from the screens and a separate trough to return fish to the lake which is intended to improve the survivorship of impinged fish when the velocity cap screens collapse. The traveling screen panels are not equipped with Ristroph buckets.

Design Intake Flow (DIF): The Unit 5 pump house has 3 circulating water pumps and 3 service water pumps. Each of the circulating pumps are rated at 41,250 gpm (59.4 MGD). Two of the service water pumps are rated at 7,100 gpm (10.2 MGD) and one is rated 1,800 gpm (2.6 MGD). The total design intake flow for the Unit 5 pump house is 201.2 MGD (311.3 cfs). This is based on the intake's total pump capacity, not counting emergency pumps.

Design Intake Velocity (DIV): The through screen design intake velocity at the point of withdrawal is 0.4 fps. This was calculated using the equation $DIV\ (\frac{ft}{s}) = \frac{DIF\ (cfs)}{Number\ of\ Screens\ x\ Screen\ Area\ \left(\frac{ft^2}{screen}\right)\ x\ Percent\ Open\ Area\ (Decimal)}$ where DIF=311.3 cfs, Number of Screens=64, Screen Area=16.3 ft^2, Percent Open Area=0.74. The point of withdrawal for compliance with the 0.5 fps impingement standard is applied at a location where water is withdrawn from waters of the state at a screen with a maximum opening dimension of 0.56 inches. The velocity caps are considered with point of

withdrawal because the screen openings have a maximum screen opening dimension that is less than 0.56 inches. If the screen panels on the velocity caps collapse (by design), the DIV at the Unit 5 pump house traveling screen is 2.97 ft/s. This was calculating using DIF=311.3 cfs, Number of Screens=3, Screen Area=70 ft^2, and Percent Open Area=0.50. The screen area is 5.84 ft x 12 ft = ~70 ft^2. Screen width = 7 ft wide screen – 1' 2" from opening = 5.4 ft. Screen length = low water elevation of 572.58 ft – bottom of screen elevation of 560.21 ft = 12 ft.

Actual Intake Flow (AIF): The average intake flow for the Unit 5 intake was 163.7 MGD (253.3 cfs) for the last five years over the period from January 1, 2010 to October 31, 2015 as identified in the permit reissuance application.

Actual Intake Velocity (AIV): The actual intake velocity at the velocity caps is 0.33 fps and calculated using the equation $AIV\ (\frac{ft}{s}) = \frac{AIF\ (cfs)}{Number\ of\ Screens\ x\ Screen\ Area\ \left(\frac{ft^2}{screen}\right)\ x\ Percent\ Open\ Area\ (Decimal)}$ where AIF=253.3 cfs, Number of Screens=64, Screen Area=16.3 ft^2, Percent Open Area=0.74. The AIV at the traveling screens is 2.4 fps where AIF=253.3 cfs, Number of Screens=3, Screen Area=70 ft^2, Percent Open Area=0.50.

Percent Used Exclusively for Cooling: 93% of intake water is used for Unit 5 condenser cooling when operating at the design intake rates. The remaining 7% of intake water is used for auxiliary equipment non-contact cooling, therefore 100% of intake flows are used exclusively for cooling.

Nearby Intakes: There are no nearby intakes other than the permittees emergency intake. The next nearest intake is at the Port Washington Generating Station which is 25 miles away.

Emergency Intakes: The facility has an emergency intake as described later in the attachment.

III. COOLING WATER INTAKE STRUCTURE 709 BTA DETERMINATION

This is an interim BTA as part of an alternate schedule for submittal of 40 CFR 122.21(r)(6), Chosen Method of Compliance with the Impingent Mortality Standard and 40 CFR 122.21(r)(2) through (13). The department granted the permittee an alternate schedule for submission of the materials required in 40 CFR 122.21(r). Pursuant to 40 CFR 125.98(b)(5), the Best Technology Available (BTA) determination for this permit issuance is an interim BTA made using the Department's best professional judgment (BPJ) rather than the final federal regulations.

The department will consider the following points in making a BTA determination using BPJ.

- Is the intake design flow velocity <0.5 fps?
- Does the facility's intake structure include a wedge-wire screen?
- Is the intake design flow <5% of the Q7,10 of the source water?
- Does the facility use a closed-cycle cooling system for >95% of its cooling needs or has the facility reduced intake flow >95% compared to once-through cooling?
- Does the facility have data that shows impingement mortality will be reduced 80-95% and, if applicable, entrainment reduced 60-90% compared to a once through cooling system with 3/8 inch traveling screens?

- Is there biological data demonstrating that 1) the source water body does not include threatened or endangered species in the vicinity of the intake and 2) there are no known aquatic life and water quality problems partly or solely due to the presence or operation of the intake structure?

The Department determined the Unit 5 CWIS can be approved as interim BTA with the permit terms and requirements contained in the draft permit. This is based on the first and sixth bullets:

- The intake design flow velocity is <0.5 fps
  - This scenario is based on consideration of design intake flow and resulting velocities. As noted above, design flow results in velocities of 0.4 fps at the screen panels on the velocity cap intake. The Department believes the design and operation of the Unit 5 intake is consistent with consideration of the 0.5 fps standard.
  - It is also noted that velocity caps are one of twelve EPA pre-approved technologies for reducing impingement mortality listed in 40 CFR 125.94(c).

- There is biological data demonstrating that: 1) the source water body does not include threatened or endangered species in the vicinity of the intake, and 2) there are no known aquatic life and water quality problems partly or solely due to the presence or operation of the intake structure.
  - The permittee has provided impingement data and entrainment data.
  - Impingement collections were made every other week over a 12-month period in 2005-2006.
  - Entrainment sampling occurred from mid-August through October 2005, April through early August 2006, June 4-5, 2009, June and July 2016-2017.

Based on both impingement (2005/2006) and entrainment (2005/2006, 2009, 2016-2017) data, the Department biologists have determined that the data submitted by the permittee supports conclusion that the current Unit 5 intake can be approved as interim BTA.

IV. REVIEW OF IMPINGEMENT DATA

The permittee conducted impingement sampling in the 12 month period of August 2005 to August 2006. The results are documented in a report dated April 2007. Sampling was performed for Intakes 702 (Units 3&4) and 709 (Unit 5), but since Units 3&4 are retired, the intake is only used for emergency purposes, therefore only data from Unit 5's intake will be discussed. The basic procedures for impingent monitoring were to collect, separate, and record the fish and shellfish in the traveling screen wash water over a period of 24 hours. Sampling was performed every other week (biweekly) over 12 months resulting in a total of 24 sampling events at in the intake. Results are summarized in the table below.

Results of 2005-2006 Impingent Sampling for Unit 5 Intake	
Live Fish Impinged Over Study Period	2,800
Actual Annual Impingement Rate for Live Fish (shellfish)	44,310 (4,605,532)
Baseline Annual Impingent Rate for Live Fish (shellfish)	45,969 (5,244,585)
Actual Annual Impingent Rate for (Dead Fish)	214
Baseline Annual Impingent Rate (Dead Fish)	199

The volume of water withdrawn using the intake is related to the electrical demand. The more demand, the greater output of the turbine, thus requiring more water for cooling. Baseline conditions represent the full capacity of the generating station at all times except for planned outages. Actual conditions were observed during the study.

Fifteen different species of fish were impinged at the Unit 5 intake. No threatened or endangered species were collected, dead or alive, during the 24 sample events (note that during the same time, the sampling of the Units 3 and 4 intake no threatened or endangered species were collected, dead or alive, during the 24 sample events). During the year-long study, alewife made up 98.1 percent of the catch, followed by slimy sculpin and burbot at 0.6 and 0.5 percent, respectively. All other species impinged included: mottled sculpin, ninespine stickleback, rainbow smelt, gizzard shad, lake trout, round goby, white sucker, brown trout, lake whitefish, longnose sucker, round whitefish, and yellow perch. The majority of shellfish impinged were zebra mussels, making up 98.7% of the total catch. The Quagga mussel made up the remaining 1.3% of the impinged shellfish.

Eight species of dead-on-arrival (DOA) fish were collected at the Unit 5 intake. The total estimated annual impingement for DOA fish assuming actual and baseline operations was 214 and 199 fish, respectively. The most commonly impinged DOA species were alewife (60.3%), lake trout (16.4%), white sucker (8.8%), gizzard shad (5.4%), Round whitefish (3.5%), and Burbot (3.4%). Other DOA species impinged during the study included round goby, slimy sculpin, spottail shiner, mottled sculpin, ninespine stickleback, and yellow perch.

The baseline for Unit 5 was determined to be 834 fish and 0 shellfish per year. Invasive species and moribund alewives were not included in the calculated baseline. Only four of 2,756 alewives (0.14%) were not impingent in May through July during the seasonal dieoff. The 2005-2006 impingement data does not require a conclusion that the current Unit 5 intake cannot be approved as interim BTA.

V. REVIEW OF ENTRAINMENT DATA

Monitoring the entrainment of the eggs and larval life stages of fish (ichthyoplankton or IP) was conducted concurrently with impingement monitoring. Entrainment sampling occurred from mid-August through October 2005 and from April through early August 2006. Sampling methods included inserting a flexible pipe in the intake screen well and pumping the screen well water through a 500 µm mesh conical plankton net and returning the intake water back to the well. Samples were collected once every six hours. The volume of water sampled was determined by pump calibration so that the density and number of IP entrained could be calculated. The facility did not collect any entrainable organisms from both Units 3&4 and Unit 5 intakes. Therefore, no entrainment baseline could be calculated from the 2005-2006 sampling.

Additional sampling was performed on June 4 and 5, 2009 for the Unit 5 intake to check sampling methodology used in 2005-2006. The study indicated that the sampling in 2005-2006 did not bias the results. The 2009 study included three methods: pumping from the traveling screen well (as used in 2005-2006), a drift net in the traveling screen well, and ambient tows in the vicinity of the intake structure in Lake Michigan. More detail is provided below.

1. Pumping: 0.5 meter diameter, 330-µm mesh net (note that this was different than 2005-2006 sampling and was in accordance with department request), sampling 24-hour period in four approximately 6 hour periods, approximately 50 cubic meter samples. Pump was equipped digital cumulating inline flow meter.

2. Drift net: 0.5 meter diameter, 330-µm mesh plankton net with measures to keep the net expanded. Net was lowered in traveling screen well. Net was equipped with open channel, mechanical cumulating flow meter to

measure volume of water that passed through the net, sampling 24-hour period in four approximately 6 hour periods, approximately 75 cubic meter samples.

3. Tows: During the drift net sampling at the traveling screen well, IP tows were deployed in Lake Michigan in the vicinity of the intake opening. Specs include 1-meter diameter, 330-µm mesh conical plankton net, two tows at surface and two at approximately 10 feet depth, eight total samples, tows were approximately ten minutes in duration, approximately 500 cubic meter samples.

No eggs or larva were found in any 2009 samples except one larva in a lake tow.

The department required additional sampling during 2016 and 2017 because the department's fisheries expert had never heard or observed an absence of IP along the western shore of Lake Michigan despite the permittee's study results indicating an absence of IP near the intakes. The raw sample results were submitted to the department on June 18, 2018.

Entrainment sampling was conducted biweekly from June through late October 2016 and in March through July 2017, for a total of 22 sampling events. The IP were sampled by deploying a 0.3 meter diameter, 330 µm conical plankton net in the well of the onshore intake structure in front of the traveling screens. A cumulating flow meter was mounted in the mouth of the plankton net for calculating sample volume. The net was deployed for ~45 mins to sample 125-285 cubic meters based on estimated water velocity in the intake well. Sampling was conducted four times per day. From the raw sampling data completed in 2016, organisms collected during entrainment sampling include: round goby, alewife, spiny-rayed fishes, and herrings. The total number of entrained organisms in 2016 was 116. In 2017, organisms collected during entrainment sampling include: perch/darters, round goby, burbot, brook silverside, herring, and alewife. The total number of entrained organisms in 2017 was 39.

The facility also conducted IP sampling in Lake Michigan during June and July 2016-2017 for a total of nine sampling events. Each sampling event consisted of four tows during the day and four tows at night. Lake Michigan ichthyoplankton samples were collected by towing a 1 meter diameter, 330 µm conical plankton net from a boat near the Unit 5 intake. Tows were made near the surface and within 1-2 meters of the lake bottom, corresponding to the approximate depth of the intake. Tow durations were between 5-10 mins with the goal of obtaining sample sizes of 100 cubic meters.

From the raw sampling data completed in 2016, organisms collected during Lake Michigan IP sampling include: alewife, herring, spiny-rayed fishes, burbot, and minnows. The total number of organisms collected in 2016 was 585. In 2017 organisms collected during Lake Michigan sampling include: alewife, round goby, and herring. The total number of organisms collected in 2017 was 104.

EDG is currently analyzing the data for their entrainment characterization study as required by 40 CFR 122.21(r)(9). The entrainment characterization study will be provided as part of the application materials during the next permit reissuance application.

The 2005-2006, 2009, and 2016-2017 data do not require a conclusion that the current Unit 5 intake cannot be approved as interim BTA.

VI. FUTURE BTA

The above determination is an interim BTA determination made using the Department's BPJ. BTA determinations made in future permit reissuances will be made in accordance with the requirements of the federal regulations in 40 CFR 125.90-98, based upon the materials submitted by the permittee through 40 CFR 122.21(r).

Also, the state is in the process of promulgating ch. NR 111, Wis. Adm. Code, on cooling water intake structures. The objective of ch. NR 111 is to incorporate federal requirements for cooling water intake structures into the state's administrative code. If ch. NR 111 is promulgated prior to the expiration of this permit, the permittee may be subject to ch. NR 111 application requirements for the next permit reissuance.

VII. CWIS OTHER REQUIREMENTS

Entrainment Characterization and Monitoring

The permittee has provided sufficient entrainment monitoring at this time. The permittee will submit a peer review of its entrainment data during the alternate schedule for submittal of 122.21(r).

Impingement Monitoring

The permittee has provided sufficient impingement monitoring at this time.

Visual or Remote Inspections

The permittee is required to conduct visual or remote inspections of the intake structure at least weekly during periods of operation, pursuant to 40 CFR 125.96(e). At present, the facility does not have remote inspection capability of its offshore intake. If the screen panels on the velocity cap collapse, the permittee believes it will be able to notice by inspecting the traveling screens at the pump house. It’s believed that an increase in debris/organisms on the traveling screen could indicate screen panels on the velocity caps collapsed. The permittee has agreed to inspect the offshore velocity caps quarterly using an underwater camera from a boat.

Reporting Requirements

The permittee is required to submit an annual certification statement and report, pursuant to 40 CFR 125.97(c).

Intake Screen Discharges and Removed Substances

Floating debris and accumulated trash collected on the water intake shall be removed and disposed of in a manner to prevent any pollutant from the material from entering the waters of the State pursuant to s. NR 205.07(3)(a), Wis. Adm. Code, except that backwashes may contain fine materials that originated from the intake water source such as sand, silt, small vegetation, or aquatic life.

Endangered Species Act

This permit does not authorize take of threatened or endangered species. The federal code at 40 CFR 125.98 (b) (1) requires the inclusion of this provision in all permits subject to 316(b) requirements. Contact the state Natural Heritage Inventory (NHI) staff with inquiries regarding incidental take of state-listed threatened and endangered species and the US Fish and Wildlife Service with inquiries regarding incidental take of federally-listed threatened and endangered species.

VIII. COOLING WATER INTAKE STRUCTURE 702

Sampling Point 702 – Emergency Intake

Monitoring Requirements and Limitations

Parameter	Limit Type	Limits and Units	Sample Frequency	Sample Type	Notes
Flow Rate		MGD	Per Occurrence	Continuous	
Intake Water Used Exclusively For Cooling		% Flow	Per Occurrence	Continuous	

The permittee describes the emergency use of the intake 702 in a May 4, 2018 letter. WPL would only operate the intake for emergency fire protection, fire protection system testing, or as a backup for service water for Unit 5 during periods of unavailability of Unit 5 fire protection water supply. It is expected the maximum intake flow rate would be similar to the emergency fire pump flow rate of 3,750 gpm (5.4 MGD). If the use of emergency intake 702 is required for emergency purposes, WPL will notify the Department within 5 days. The emergency cooling water intake structure is included as a component of the water intake system technologies for Unit 5 Intake 709 and is also considered to be BTA. Because of limited use on an emergency basis, its environmental impact is minimized.

Cooling Water Intake Structure (CWIS) 702 for Emergency Use: The Influent section of the permit includes the CWIS authorization for use. The permittee is authorized to use the cooling water intake structure 702 which consists of the following.

Location: Intake 702 is located 1,500 ft off the western shore of Lake Michigan in Sheboygan County in eastern Wisconsin. The pump house is located at 43° 43' 0.3" N, 87° 41' 59.3" W. Similarly to Intake 709, the exact location of the intake is not disclosed for security purposes.

Source Waterbody Information: Intake 702 withdraws water from Lake Michigan. Lake Michigan has a surface area of 22,300 square miles and maximum and average depths of 925 and 279 feet, respectively. The lake holds 1,180 cubic miles of water, which represents about 22 percent of all the water in the Great Lakes system. Near the facility, water depth increases at a gradual rate from the shoreline. The substrate is primarily sand with occasional rock outcrops. The substrate is not particularly conducive for the growth of aquatic macrophytes. Instead, filamentous algae take advantage of the increased water clarity and grow on the bottom of the lake. Under certain wind conditions, the algae will break loose from the bottom and wash ashore in nuisance quantities.

General Description: The emergency intake 702 withdraws water through a 23.5-foot diameter intake well located 1,500 feet offshore. Water enters the intake well through four, 5 by 5 foot openings that do not have screens or grates.

Major Components: The emergency intake 702 withdraws water through a 23.5-foot diameter intake well located 1,500 feet offshore. Water enters the intake well through four, 5 by 5 foot submerged openings that do not have screens or grates. Water from the 5 ft x 5 ft openings is piped to an onshore pump house that contains three, 10 foot wide, 30 foot high, 3/8-inch mesh traveling screens. The traveling screens have low pressure sprays to remove fish and debris from the screens. The fish and debris collected from the screen are sluiced to a basket for disposal, they are not returned to the lake.

Design Intake Flow (DIF): It is expected the maximum intake flow rate would be similar to the emergency fire pump flow rate of 3,750 gpm (5.4 MGD, 8.36 cfs). The Unit 3&4 intake pump house contains:

- Two, Unit 3 circulating water pumps rated at 22,500 gpm (32.4 MGD) each
- Two, Unit 4 circulating water pumps rated at 57,000 gpm (82.1 MGD each

- Two, Unit 4 service water pumps rated at 11,000 gpm (15.8 MGD) each
- One, Unit 3 auxiliary cooling pump rated at 500 gpm (0.72 MGD).

The total DIF of the Unit 3&4 pump house is 181,500 gpm (404.4 cfs, 261.4 MGD).

Design Intake Velocity (DIV): The DIV at the velocity cap is 0.08 fps at fire suppression DIF. This was calculated using the equation $DIV\ (\frac{ft}{s}) = \frac{DIF\ (cfs)}{Number\ of\ Screens\ x\ Screen\ Area\ \left(\frac{ft^2}{screen}\right) x\ Percent\ Open\ Area\ (Decimal)}$ where DIF=8.36 cfs, Number of Screens=4, Screen Area=25 ft^2, Percent Open Area=1.0. The DIV at the traveling screen is 0.06 fps. This was calculated using the above formula where DIF=8.36 cfs, Number of Screens=3, Screen Area=93.4 ft^2, Percent Open Area=0.50. The screen width was calculated using a 10 ft width – 1' 2" opening width = 8.83 ft. The screen height was calculated using a low water elevation of 572.58 ft subtracting the bottom screen elevation of 562 ft = 10.58 ft. The DIV at the velocity cap if the Unit 3&4 pump house were to be used for a Unit 5 backup is 4.04 fps. This was calculated using the equation $DIV\ (\frac{ft}{s}) = \frac{DIF\ (cfs)}{Number\ of\ Screens\ x\ Screen\ Area\ \left(\frac{ft^2}{screen}\right) x\ Percent\ Open\ Area\ (Decimal)}$ where DIF=404.4 cfs, Number of Screens=4, Screen Area=25 ft^2, Percent Open Area=1.0. The DIV at the traveling screen if the Unit 3&4 pump house were to be used for a Unit 5 backup is 2.89 fps. This was calculated using the above formula where DIF=404.4 cfs, Number of Screens=3, Screen Area=93.4 ft^2, Percent Open Area=0.50.

Attachment 3: Effluent Limit Guidelines (ELG) and Technology Based Effluent Limits (TBEL)

I. BACKGROUND

Wisconsin Power and Light – Edgewater Generation Station (EDG), operates a steam electric generating plant located on the western shore of Lake Michigan just south of Sheboygan, Wisconsin. The plant has one generating unit (Unit 5) which uses subbituminous coal as the fuel source and has a nameplate capacity of 380 megawatts (MW) of electricity. Technology based limitations for steam electric power generating are federally regulated under 40 CFR Part 423 and state regulated under ch. NR 290, Wis. Adm. Code. Chapter NR 290, Wis. Adm. Code was lasted updated in 1986 and does not contain the 2015 federal amendments. Therefore, federal regulations will be referenced in this attachment. Section NR 220.13, Wis. Adm. Code gives the department authority to incorporate updated federal effluent guidelines in WPDES permits.

II. NEW OR EXISTING SOURCE DETERMINATION

As indicated in Appendix B of EPA's September 28, 2006 Memo subject "New Source Dates for Direct and Indirect Dischargers" from Linda Boornazian (commonly referred to as the Boornazian Memo), the new source date for direct dischargers in the Steam Electric Power Generation category is November 19, 1982. EDG has one generating unit (Unit 5) which was installed in 1985. Therefore, discharges from Unit 5 operations are subject to new source performance standards (NSPS). 40 CFR 423.15 states that any new source as of November 19, 1982 must achieve NSPS in addition to Best Available Technology Economically Achievable (BAT) in 40 CFR 423.13. In the case of conflict, the more stringent of the two requirements shall apply.

III. 40 CFR 423.15(a)(1) pH

The pH of all discharges expect once through cooling water shall be within the range of 6.0 to 9.0. The ELGs for pH are also the same as the WQBEL limits and therefore pH limits may be applied at the discharge to surface water instead of at the in-plant sampling point.

IV. 40 CFR 423.15(a)(2) PCBs

There shall be no discharge of polychlorinated biphenyl compounds such as those commonly used for transformer fluid. The permittee has verified that all PCB transformer equipment has been removed from the site as of March 23, 2016. Therefore permit application sampling is not warranted.

V. 40 CFR 423.15(a)(3) LOW VOLUME WASTE (LVW) LIMITS

LVW limits in 40 CFR 423.15(a)(3) must be calculated for two flow rates because boiler blowdown is segregated from the rest of the LVWW. As described in Part XIII of this attachment, limits for boiler blowdown are applied at SP 103 and limits for the rest of the LVWW are applied SP 107. A flow rate of 52 gpm (0.075 MGD) was used for SP 103 and a flow rate of 200 gpm (0.288 MGD) was used at SP 107. The following equation was used to calculate the mass limit:

$$Mass\ Limit\ \left(\frac{Lbs}{Day}\right) = Conc.Limit\ \left(\frac{mg}{L}\right) x\ Daily\ Flow\ (MGD)\ x\ 8.34$$

The following limits were calculated to two significant figures.

Sample Point	Pollutant	Flow (MGD)	Daily Max Concentration Limit (mg/L)	Daily Max Mass Limit (lbs/day)	Monthly Avg Concentration Limit (mg/L)	Monthly Avg Mass Limit (lbs/day)

103	TSS	0.075	100	63	30	19
103	O&G	0.075	20	13	15	9.4
107	TSS	0.288	100	240	30	72
107	O&G	0.288	20	48	15	36

VI. 40 CFR 423.15(a)(4) CHEMICAL METAL CLEANING WASTES

The permittee does not discharge metal cleaning wastes as defined in 40 CFR 423.11(d).

VII. 40 CFR 423.15(a)(6) BOTTOM ASH TRANSPORT WATER

Unit 5 bottom ash system was converted to a pneumatic dry bottom ash handling system in September 2018. There is no water associated with bottom ash handling, therefore, limits for bottom ash transport water are not applicable.

VIII. 40 CFR 423.15(a)(7) FLY ASH TRANSPORT WATER

The permittee installed a dry scrubber, baghouse, and selective catalytic converter for Unit 5. All by-products including fly ash handling are completely dry and therefore complies with the requirement there be no discharge of pollutants in fly ash transport water. There are no ELG wastewaters from the scrubber system.

IX. 40 CFR 423.15(a)(8) ONCE THROUGH COOLING WATER

EDG Unit 5 has a total rated electric generating capacity of 380 MW and discharges once through cooling water through Sampling Point 108 and ultimately through Outfall 009. The maximum annual flow of once through cooling water is 199 MGD as indicated on page 41 of the permit application. As described in Part XIII of this attachment, ELGs for once through cooling water will be applied at SP 108.

Pollutant	Flow (MGD)	Max Concentration Limit (mg/L)	Max Mass Limit (lbs/day)
Total residual chlorine	199	0.20	332

Total residual chlorine may only be discharge from any single generating unit for more than two hours per day when the permittee demonstrates to the department that discharge for more than two hours is required for macroinvertebrate control.

X. 40 CFR 423.15(a)(10) COOLING TOWER BLOWDOWN

EDG does not have cooling towers and consequently does not have cooling down blowdown. Therefore, limits for cooling tower blowdown are not applicable.

XI. 40 CFR 423.15(a)(11) COAL PILE RUNOFF

The amount of TSS discharged in coal pile runoff shall not exceed 50 mg/L at any time except when discharging untreated overflow from a rainfall event greater than or equal to the 10 year, 24 hour design storm. The permittee requested the department specify what the 10-year, 24 hour design storm is. Using NOAA Atlas 14, Volume 8, Version 2 and location of Sheboygan, WI, the 10-year, 24-hour storm event is 3.34 inches of rainfall.

XII. 40 CFR 423.15(a)(13) CONCENTRATION VERSUS MASS LIMITS

The department has discretion to express limits on either a concentration or mass basis. Due to the numerous changes at the facility to include Unit 3 and 4 retirements, air quality system upgrades, Unit 5 dry ash transport system, and rerouting and reuse of LVWW, the department proposes to express limits on a concentration basis. The exception is SP 103 where a

mass limit must be included due to the mass balance nature of determining compliance with the ELG as described in Part XIII of this attachment. Once the facility is able to abandon their coal combustion residual ponds and operations have stabilized, the department may reevaluate.

XIII. 40 CFR 423.15(a)(14) COMBINED WASTE STREAMS

Due to the combining of LVWW with cooling waters discharged through Outfall 009 additional sampling points are needed to ensure the limits for each pollutant tied to the specific waste stream are met prior to mixing. The department included the following additional sampling points:

Sample Point 103, 105, and 106: These sampling points are before and after the boiler blow-off tank. Boiler blowdown is the only LVWW source that is segregated from the rest of the plant's LVWW. At SP 105, a grab sample of service water supply will be taken prior to mixing with the boiler blowdown and a mass will be calculated based on a corresponding flow measurement. Due to the flash steam generated in the blow-off tank it's difficult and dangerous to collect a sample. At SP 106, a grab sample of combined boiler blowdown and service water supply will be collected and a mass will be calculated based on a corresponding flow measurement. SP 103 is where ELG limits for TSS and O&G will be applied on a mass basis. The permittee will determine compliance with the ELGs at SP 103 by subtracting the mass at SP 105 from the mass at SP 106.

Sample Point 107: LVWW (except for boiler blowdown) is sent to the WPDES surge tanks and is intended to be reused in the AQCS scrubber. However, there are operational circumstances in which the permittee may have to discharge this LVWW. Therefore SP 107 is established to assess compliance with LVWW ELGs prior to mixing with condensate cooling waters and discharged through Outfall 009.

Sample Point 108: An internal sample point is also needed to assess compliance with once through cooling water ELGs prior to mixing with LVWW and discharging through Outfall 009. Flow and total residual chlorine will be sampled at SP 108.

XIV. 40 CFR 423.13 BEST AVAILABLE TECHNOLOGY ECONOMICALLY ACHIEIVABLE (BAT)

As mentioned in Part II of this attachment, 40 CFR 423.15 states that any new source as of November 19, 1982 must achieve NSPS in addition to Best Available Technology Economically Achievable (BAT) in 40 CFR 423.13. The more stringent of the two requirements shall apply. EDG only has three waste streams that are subject to ELGs which include LVWW, once through cooling water, and coal pile runoff. For those waste streams the limits and parameters for NSPS and BAT are the same.

As part of the 2015 rule amendments to the Steam Electric Power Generation ELGs, additional BAT limits were included for the following waste streams:

1) FGD wastewater
2) Fly ash transport water
3) Flue gas mercury control wastewater
4) Gasification wastewater
5) Bottom ash transport water
6) Combustion residual leachate

EDG does not discharge any of the waste streams listed above in 1-6 because the facility installed a dry scrubber, baghouse, selective catalytic converter, and pneumatic dry bottom ash handling system for Unit 5. These technologies are dry and do not generate wastewater, thus they are compliant with the ELGs. Since the waste streams do not exist, the limits are not applicable.

XV. 40 CFR 423.15(b) 2015 NSPS

New sources as of November 17, 2015 are required to achieve the NSPS of paragraph (b) of this section. Unit 5 was a new source as of 1985 and therefore is not subject to the 2015 NSPS. As an existing source (in relation to the 2015 rule), Unit 5 is subject to the BAT limits and compliance dates in 40 CFR 423.13.

XVI. SUMMARY OF ELG LIMITS

Sample Point	Parameter	Limit Type	Limits and Units
103	TSS	Daily Max	63 lbs/day
103	TSS	Monthly Avg	19 lbs/day
103	O&G	Daily Max	13 lbs/day
103	O&G	Monthly Avg	9.4 lbs/day
103	pH	Within Range	6.0-9.0 s.u.
104	TSS	Daily Max	50 mg/L
104	pH	Within Range	6.0-9.0 s.u.
107	TSS	Daily Max	100 mg/L
107	TSS	Monthly Avg	30 mg/L
107	O&G	Daily Max	20 mg/L
107	O&G	Monthly Avg	15 mg/L
107	pH	Within Range	6.0-9.0 s.u.
108	TRC	Daily Max	0.20 mg/L

Attachment 4: Water Quality Based Effluent Limits (WQBEL)

CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: February 10, 2020

TO: Ian Hansen – WY/3

FROM: Wade Strickland – WY/3

SUBJECT: Water Quality-Based Effluent Limitations for the Wisconsin Power and Light Edgewater Generating Station WPDES Permit No. WI-0001589-09-0

This is in response to your request for an evaluation of the need for water quality-based effluent limitations using Chapters NR 102, 104, 105, 106, 207, 210 and 217 of the Wisconsin Administrative Code (where applicable), for the discharge from the Wisconsin Power and Light Edgewater Generating Station (EDG) in Sheboygan County. This primary industry discharges to Lake Michigan, with occasional discharges to the Black River, located in the Black River Watershed in the Sheboygan River Basin. The evaluation of the permit recommendations is discussed in more detail in the attached report.

Based on our review, the following recommendations are made on a chemical-specific basis:

Outfall 004 – Process Wastewater

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Footnotes
TSS	82 mg/L			30 mg/L	
pH	9.0 s.u.	6.0 s.u.			
Oil and Grease	14 mg/L			11 mg/L	
Phosphorus				0.6 mg/L	1
Iron	1.0 mg/L			1.0 mg/L	
Mercury	7.3 ng/L				
Arsenic	5.1 µg/L				2
Zinc					3

Outfall 009 – Condenser Cooling Water and Low Volume Wastewater

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Footnotes
pH	9.0 s.u.	6.0 s.u.			
Temperature, Maximum					3
Copper, Total Recoverable	**42 ug/L**			42 ug/L 70 lbs/day	4
Mercury	7.3 ng/L				
Arsenic	5.1 µg/L				2

Outfall 014 - Oil Tank Secondary Containment

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Footnotes
Oil and Grease	15 mg/L				
BEXT, Total					3
PAHs					3

Footnotes:

1. This is an interim limit based on a level that is currently attainable for the discharge from Outfall 004. Water quality based effluent limits may apply when a near shore or whole lake model is approved by the Department.
2. An initial effluent limitation of 5.1 µg/L expressed as a daily maximum may be included in the permit in place of the water quality-based effluent limit if the arsenic variance application that was submitted is approved by EPA. Otherwise, the water quality-based criteria limit of 0.2 ug/L as a monthly average, as well as a respective mass limit and daily max limit would be required in the permit.
3. Monitoring only.
4. Additional limits to comply with s. NR 106.07 are included in bold.

Outfall 002 no longer discharges any cooling water or contains process wastewater. Because of this change, copper and temperature monitoring are no longer recommended at Outfall 002. The heat limits that applied to combined Outfall 029 are also no longer applicable (contingent on the approval of the 2018 Thermal Mixing Zone study submitted by Alliant Energy).

Along with the chemical-specific recommendations mentioned above, the need for acute and chronic whole effluent toxicity (WET) monitoring and limits has also been evaluated for the discharge from the Edgewater Generating Station. Following the guidance provided in the Department's November 1, 2016 *Whole Effluent Toxicity Program Guidance Document - Revision #11*, **annual acute and chronic WET testing is recommended at Outfall 004.**

Sampling WET concurrently with any chemical-specific toxic substances is recommended. Chronic testing shall be performed using a dilution series of 100%, 30%, 10%, 3% & 1%. The Instream Waste Concentration to assess chronic test results is 9.1%. The primary control and dilution water used in WET tests conducted on Outfalls 009 and 004 shall be a grab sample collected from the receiving water.

Please consult the attached report for details regarding the above recommendations. If there are any questions or comments, please contact Rachel Fritz at (608) 267-7657 (Rachel.Fritz@wisconsin.gov) or Diane Figiel at (608) 264-6274 (Diane.Figiel@wisconsin.gov).

Attachments (4) – Narrative, Mercury Mixing Zone, Arsenic Monitoring Results & Map

PREPARED BY: Rachel Fritz date: 2/10/20
Rachel Fritz – Water Resources Engineer

e-cc: Curt Nickels, Wastewater Engineer – SE/Plymouth
Jason Knutson, Wastewater Section Chief – WY/3
Diane Figiel, Water Resources Engineer – WY/3
Kari Fleming, Biomonitoring Coordinator – WY/3

Attachment #1

Water Quality-Based Effluent Limitations for
Wisconsin Power and Light - Edgewater Generating Station

WPDES Permit No. WI-0001589-9

Prepared by: Rachel Fritz

PART 1 – BACKGROUND INFORMATION

Facility Description:
Wisconsin Power and Light - Edgewater Generating Station (Wisconsin Power and Light Company) referred to here as EDG, operates a steam electric generating plant, located on the western shore of Lake Michigan just south of Sheboygan, Wisconsin. Coal is the primary fuel used at the plant.

The plant discharges wastewater to Lake Michigan at six locations, designated as Outfalls 002, 004, 006, 009, 010, and 012. There is also an episodic discharge from a fuel oil tank area (Outfall 014), which may occur immediately following a storm event. That discharge is directed to a roadside ditch, which ultimately joins the Black River. See the table below for descriptions of each outfall. Attachment #2 is a map of the area showing the approximate location of each outfall.

Units 3, 4, and 5 were operating in 2013 when the permit was last reissued. Unit 3 was retired on January 1, 2016, dropping the combined capacity of the facility from 770 megawatts to 710 megawatts**.** Unit 4 was retired on September 30, 2018, which brought the combined capacity down to 380 megawatts and eliminated the need for Outfalls 006 and 029. The only discharges remaining at Outfall 002 are related to the fire protection system which does not have any contact with process wastewaters, and there is no longer any heat load associated with this discharge.

In the near future, process wastewater will no longer be routed to Outfall 004 and the coal combustion residual ponds will be dewatered and closed. Low volume process wastewater (LVWW) that was previously discharged to the ponds will be reused as makeup water in the scrubber system. However, the LVWW will need to be diverted and discharged via Outfall 009 during condensate polisher regeneration and during periods of abnormal operation (startup, shutdown, steady state low load, etc.) The facility has plans to switch polisher systems in the future pending further investigations and engineering, so that regeneration water is no longer needed.

Wisconsin Power and Light Company is requesting an arsenic variance and a continued mixing zone for mercury in Lake Michigan.

Sample Point	Flow Type	Sample Point Description
002	Emergency Intake Testing	This outfall is for the discharge of non-contact service water withdrawn from Lake Michigan using emergency intake Sampling Point 702. The intake water is used to verify the emergency intake system is functional. It is anticipated that the intake pumps will run for ~20-60 minutes on a monthly basis. Intake water will not come in contact or be associated with any process. This outfall was previously used to monitor the discharge of

		NCCW and boiler blowdown for Units 3 and 4, which are now retired.
004	Process Wastewater	This outfall is for the discharge of process wastewater, stormwater, ion exchange demineralization regeneration, and coal pile runoff. Once the coal combustion residual (CCR) ponds are abandoned, only stormwater and coal pile runoff while be discharged.
009	Unit 5 Cooling Water	Unit 5 once-through condenser cooling water and service water discharged to Lake Michigan. The discharge may occasionally contain low volume wastewaters (LVWW) if the LVWW cannot be reused in the Unit 5 Air Quality Control System (AQCS) scrubber.
010	Unit 5 Water Intake Deicing	Recycling of Unit 5 condenser cooling water to deice the Lake Michigan water intake structure.
012	Fish Return water	Fish return trough from Unit 5 travelling intake screen
014	Oil Tank Secondary Containment	Storm water within oil storage tank secondary containment berm and effluent from the oil/water separator from the fuel oil pump house, discharges to a ditch that eventually joins the Black River.
Intake 709	Unit 5 Intake	Two velocity cap intakes used for Unit 5.

Existing Permit Limitations: The current permit, which expired on 06/30/2018, includes the following effluent limitations.

Outfall 002 and Outfall 009 – Condenser Cooling Water

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Footnotes
Temperature, Maximum					1
Copper, Total Recoverable					1

Outfall 004 – Process Wastewater

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Footnotes
TSS	82 mg/L			30 mg/L	2
pH	9.0 s.u.	6.0 s.u.			2
Oil and Grease	14 mg/L			11 mg/L	2
Phosphorus				1.0 mg/L	
Iron	1.0 mg/L			1.0 mg/L	2
Mercury					1
Arsenic				0.2 µg/L 0.008 lbs/day	
Zinc					1
Copper	1.0 mg/L			1.0 mg/L	3

Outfall 014 – Oil Water Secondary Containment

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Footnotes
Oil and Grease	15 mg/L				2
BEXT, Total					1
PAHs					1

Outfall 029 – Combined Discharge of 002 and 009 for Temperature Limits

Parameter	Daily Average	Weekly Average	Monthly Average	Footnotes
Heat				
October	3303 MBTU/hr			4
November	3599 MBTU/hr			

Footnotes:

1. Monitoring only.
2. These limitations are based on categorical standards and are not being evaluated as part of this review.
3. These copper limits are based on categorical standards for metal cleaning waste that no longer apply to the discharge. These limits will be removed at permit reissuance.
4. The combined heat load from Outfall 002 and 009 is calculated based on an equation detailed in the current permit. These limits may be removed from the current permit when Unit 4 is retired, contingent on the approval of the 2018 Thermal Mixing Zone study submitted by Alliant Energy

Receiving Water Information:

- Name: Lake Michigan
- Classification: Cold water community, public water supply.
- Flow: A ten-to-one dilution ratio will be used for calculating effluent limitation based on chronic or long-term impacts, in accordance with s. NR 106.06(4)(b)2, because the receiving water does not exhibit a unidirectional flow at the point of discharge.
- Hardness = 139 mg/L as $CaCO_3$. This value represents the geometric mean of data from SWAMP WET testing collected from 2000 and 2014
- Source of background concentration data: Background As, Hg, Cu, Cl-, and Sb comes from the available intake monitoring data. Other metals data is the same background data used in the Sheboygan Wastewater Treatment Facility, which discharges nearby. The numerical values are shown in the tables below. If no data is available, the background concentration is assumed to be negligible and a value of zero is used in the computations.

	Intake 702 and 709 As - µg/L (2012-2018 data)	Intake 709 Hg – ng/L (01/2013-02/2019)
1-day P_{99}	1.7	1.81
4-day P_{99}	1.3	1.10
30-day P_{99}	1.0	0.74
Mean	0.90	0.57
Std	0.26	0.35
Sample size	33	25
Range	0.51-2.2	0.19-1.46

- Multiple dischargers: Sheboygan WWTF discharges about 0.3 mi away from the Edgewater Generating Station. The only limits in this permit where available dilution is potentially limiting are the thermal limits, and there are no heat loading issues with the discharge from Sheboygan WWTF. Because of the level of dilution available, overlapping mixing zones are not considered further.
- Impaired water status: The Lake Michigan shore in Sheboygan County is impaired for PCBs and Mercury.

Effluent Information:

- Flow Rates: The flows below (in MGD) are from actual flow data taken from January 2013 to March 2019. The maximum annual average flow is used as the representative effluent flow rate in this evaluation. Since October 2018, flows at Outfall 002 have been reduced to an average of 15.8 MGD.

	004	009	010	012	014
Maximum Annual Average	8.85	183	26.5	0.23	0.00040
Peak Daily	19.6	201	27.7	1.19	0.00040
Peak Weekly	13.0	199	44.9	0.98	0.00040
Peak Monthly	11.4	199	44.9	0.47	0.00040
Average Daily	7.31	162	18.9	0.16	0.00029

- Hardness = The effluent hardness values below represent the geometric mean of data from the permit applications for each outfall:

	Effluent hardness (mg/L as $CaCO_3$)
Outfall 002	139
Outfall 004	152
Outfall 009	141

- Acute dilution factor used: Not applicable – this facility does not have an approved Zone of Initial Dilution (ZID).
- Effluent characterization: This facility has primary industrial outfalls, so the permit application required effluent sample analyses for all common pollutants plus volatile organics and acid extractable compounds at Outfall 002, 004, and 009. The permit-required monitoring for As, Cu, Fe, Hg and Zn from January 2013 to November 2017 is used in this evaluation. Arsenic data from 2017, 2018, and 2019 taken at Outfall 004 is also used.

	Outfall 004				Outfall 002	Outfall 009
	As - µg/L	Cu - µg/L	Zn -µg/L	Hg - ng/L	Cu - µg/L	Cu - µg/L
1-day P_{99}	5.1	11.3	92.1	7.30	23.8	185
4-day P_{99}	3.4	6.69	54.6	4.52	16.6	102
30-day P_{99}	2.5	3.51	29.4	3.12	9.62	45.4
Mean	2.1	1.97	18.7	2.38	6.48	22.2
Std	0.93	2.53	20.1	1.39	4.64	45.2
Sample size	18	72	18	27	18	25
Range	1.1 - 4.7	<0.0063 - 14.1	<9.3 - 77.2	0.89 – 6.89	<6.3 - 23.3	<6.3 - 154

"<" means that the pollutant was not detected at the indicated level of detection. The mean concentration was calculated using zero in place of the non-detected results.

Because of recent facility changes, not all the effluent data in the table above may be representative of current facility operations. Coal combustion residual is no longer sent to the ponds as of May 2018 so effluent data reported since this date is summarized below.

Outfall 004 (since May 2018)			
	Cu - µg/L	Zn -µg/L	Hg - ng/L
05/03/2018			4.08
05/04/2018		15.6	
08/02/2018			2.00
11/01/2018			1.48
02/04/2019			1.64
03/05/2019	6.90		
Mean	6.90	15.6	2.30

Outfall 004 - Arsenic (µg/L)			
06/03/2018	1.9	03/05/2019	2.1
07/05/2018	1.8	04/02/2019	2.6
08/01/2018	1.6	05/14/2019	1.5
09/10/2018	1.4	06/03/2019	1.6
10/08/2018	2.5	07/01/2019	4.7
11/05/2018	1.6	08/06/2019	3.3
12/14/2018	1.3	09/09/2019	3.4
01/08/2019	1.1	10/01/2019	2.2
02/04/2019	1.1		

Unit 4 was decommissioned on September 30, 2018, and this may have changed the characterization of the discharge from Outfall 002. However, no recent copper data has been collected since this date. The available monitoring data for Outfall 002 is used in this evaluation. But lacking recent representative data, it should be noted that the levels of copper and other pollutants in Outfall 002 might be different than the available monitoring data.

Effluent data for substances for which a single sample was analyzed is shown in the tables in Part 2 below, in the column titled "MEAN EFFL. CONC.".

Attachment #1

The following table presents the average concentrations and measurements at each outfall from January 2013 to January 2018 for all parameters with limits in the current permit:

	Outfall 002	Outfall 004	Outfall 009	Outfall 014	Outfall 029
Copper	6.48 µg/L	2.53 µg/L	10.0 µg/L		
Arsenic	0.83 µg/L	2.1 µg/L	0.87 µg/L		
Heat					1940 MBTU/hr
Iron		0.38 mg/L			
Oil & Grease		0.018 mg/L		<0.4 mg/L	
pH Field		8.15 s.u.			
Phosphorus		0.048 mg/L			
Total Suspended Solids		14.1 mg/L			
Temperature	78 °F		77 °F		

*Results below the method detection limit (also known as the level of detection, or LOD) were included as zeroes in calculation of average.

- Water Source: More than 99% of the water used at the facility is sourced from two intake structures on Lake Michigan. Small amounts of municipal water from the City of Sheboygan (also sourced from Lake Michigan) are also used, primarily in the discharges from Outfalls 004 and 009.
- Additives: Nine water quality conditioners are used at Outfall 004. These are evaluated in Part 9.

PART 2 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR TOXIC SUBSTANCES – EXCEPT AMMONIA NITROGEN

In general, permit limits for toxic substances are recommended whenever any of the following occur:

1. The maximum effluent concentration exceeds the calculated limit (s. NR 106.05(3), Wis. Adm. Code)
2. If 11 or more detected results are available in the effluent, the upper 99th percentile (or P_{99}) value exceeds the comparable calculated limit (s. NR 106.05(4), Wis. Adm. Code)
3. If fewer than 11 detected results are available, the mean effluent concentration exceeds 1/5 of the calculated limit (s. NR 106.05(6), Wis. Adm. Code)

The following tables list the water quality-based effluent limitations for this discharge along with the results of effluent sampling for all the detected substances. All concentrations are expressed in term of micrograms per Liter (µg/L), except for hardness and chloride (mg/L) and mercury (ng/L).

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

RECEIVING WATER FLOW = 10:1 Dilution

Outfall 002							
SUBSTANCE	REF. HARD. mg/L	ATC	MAX. EFFL. LIMIT**	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	1-day P_{99}	1-day MAX. CONC.
Arsenic		340	679			1.8	1.3
Cadmium	139	6.35	12.7	2.54	0.31		
Chromium	139	2360	4720	943	<1.0		
Copper	139	21.1	41.3			23.8	23.3
Lead	139	147	294	58.7	0.88		
Mercury (ng/L)		830	830	166	0.536		
Nickel	139	619	1240	248	1.10		
Zinc	139	160	320	64.1	<4.6		
Chloride (mg/L)		757	1500	300	14.4		

Outfall 004							
SUBSTANCE	REF. HARD. mg/L	ATC	MAX. EFFL. LIMIT**	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	1-day P_{99}	1-day MAX. CONC.
Arsenic		340	679			5.1	4.7
Cadmium	152	7.03	14.1	2.81	0.49		
Chromium	152	2540	5080	1020	2.0		
Copper	152	23.0	45.0			11.3	14.1
Lead	152	160	320	64.0	2.1		
Mercury (ng/L)		830	830			7.30	6.89
Nickel	152	668	1340	267	2.1		
Zinc	152	173	346			92.1	77.2
Chloride (mg/L)		757	1500	300	17.2		

Outfall 009							
SUBSTANCE	REF. HARD. mg/L	ATC	MAX. EFFL. LIMIT**	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	1-day P_{99}	1-day MAX. CONC.
Arsenic		340	679			1.3	1.1
Cadmium	141	6.48	13.0	2.59	0.79		
Chromium	141	2390	4785	957	<1.0		
Copper	141	21.5	42.0			**185**	**154**
Lead	141	149	299	59.7	0.53		
Mercury (ng/L)		830	830	166	0.28		
Nickel	141	629	1260	251	1.7		
Zinc	141	163	325	65.1	9.7		
Chloride (mg/L)		757	1500	300	14.6		

* * The 2 x ATC method of limit calculation yields a more restrictive limit than consideration of ambient concentrations and the available mixing zone per the changes to s. NR 106.07(3), Wis. Adm. Code, effective 09/01/2016.

Weekly Average Limits based on Chronic Toxicity Criteria (CTC)

RECEIVING WATER FLOW = 10:1 Dilution

SUBSTANCE	REF. HARD. mg/L	CTC	MEAN BACK-GRD.	WEEKLY AVE. LIMIT	1/5 OF EFFL. LIMIT
Arsenic		148	0.90	1620	
Cadmium	139	3.18	0.0085	34.9	6.98
Chromium	139	113	0.49	1230	247
Copper	139	13.7	0.975	141	
Lead	139	38.4	0.052	422	84.4
Mercury (ng/L)		440	0.57	440	88.0
Nickel	139	68.8		757	151
Zinc	139	160	0.39	1760	352
Selenium		5.00		55.0	11.0
Chloride (mg/L)		395	13.2	4210	843

	Outfall 002		**Outfall 004**		**Outfall 009**	
	MEAN EFFL. CONC.	4-day P_{99}	MEAN EFFL. CONC.	4-day P_{99}	MEAN EFFL. CONC.	4-day P_{99}
Arsenic		1.3		3.4		1.1
Cadmium	0.31		0.49		0.79	
Chromium	<1.0		2.0		<1.0	
Copper		16.6		6.69		102
Lead	0.88		2.1		0.53	
Mercury (ng/L)	0.536			4.52	0.28	
Nickel	1.1		2.1		1.7	
Zinc	<4.6			54.6	9.7	
Selenium	0.57		0.77		0.4	
Chloride (mg/L)	14.4		17.2		14.6	

Monthly Average Limits based on Wildlife Criteria (WC)

RECEIVING WATER FLOW = 10:1 Dilution

SUBSTANCE	WC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN **Outfall 002**	30-day P_{99} **Outfall 004**	MEAN **Outfall 009**
Mercury (ng/L)	1.3	0.57	1.3	0.26	0.536	**3.12**	0.28

Attachment #1

Monthly Average Limits based on Human Threshold Criteria (HTC)

SUBSTANCE	HTC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT
Antimony	5.6	0.19	59.7	11.9
Cadmium	4.4	0.0085	48.3	9.66
Chromium (+3)	100	0.49	1100	219
Lead	10	0.052	109	21.9
Mercury	1.5	0.57	1.5	0.30
Nickel	100		1100	220
Selenium	50		550	110
Silver	140		1540	308
Thallium*	1.4		15.4	3.08

* The limit for this substance is based on a secondary value.

	Outfall 002		**Outfall 004**		**Outfall 009**	
	MEAN EFFL. CONC.	30-day P_{99}	MEAN EFFL. CONC.	30-day P_{99}	MEAN EFFL. CONC.	30-day P_{99}
Antimony	0.59		0.7		0.37	
Cadmium	0.31		0.49		0.79	
Chromium	<1.0		2.0		<1.0	
Lead	0.88		2.1		0.53	
Mercury (ng/L)	0.536			3.12	0.28	
Nickel	1.1		2.1		1.7	
Selenium	0.57		0.77		0.4	
Silver	0.20		0.17		0.13	
Thallium*	0.54		0.6		0.42	

Monthly Average Limits based on Human Cancer Criteria (HCC)

RECEIVING WATER FLOW = 10:1 Dilution

SUBSTANCE	HCC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	30-day P_{99} **Outfall 002**	30-day P_{99} **Outfall 004**	30-day P_{99} **Outfall 009**
Arsenic	0.20	0.90	0.20		0.97	**2.5**	0.94

Because only one substance for which Human Cancer Criteria exists was detected, determination of the cumulative cancer risk is not needed per s. NR 106.06(8), Wis. Adm. Code.

Conclusions and Recommendations: Based on a comparison of the effluent data and calculated effluent limitations, effluent limitations are apparently needed for Copper, Arsenic, and Mercury.

Copper at Outfall 009

Three copper monitoring results since 2013 (all occurring in 2018) exceeded the calculated daily maximum limitation of 42 ug/L. Therefore, this copper limit should be included in the reissued permit. A respective mass limits of 70 lbs/day (0.042 mg/L x 201 MGD x 8.34) should also be included in the

permit, expressed as a daily maximum. To meet the expression of limits requirements outlined in NR 106.07 Wis. Adm. Code, a monthly average limit of 42 µg/L set equal to the daily max limit is also needed.

Based on comments provided by the facility in the discharge monitoring reports, it appears that these high copper values are associated with startup operations, especially after an extended period of shut down. It may be appropriate to include a compliance schedule in the permit to investigate and try to mitigate this issue.

Intake Credits for Outfall 002

Arsenic:

Based on the effluent concentrations at Outfalls 002 alone, arsenic limits would be needed. However, updates to s. NR 106.06(6) allow a facility to demonstrate that an intake pollutant in the discharge does not cause, have the reasonable potential to cause, or contribute to the excursion of water quality criteria in the receiving water. The demonstration has five conditions, all of which must be met:

- The permittee withdraws 100 percent of its intake water containing the substance from the same body of water into which the discharge is made;
- The permittee does not contribute any additional mass of the substance to the wastewater;
- The permittee does not alter the substance chemically or physically in a manner that would cause adverse water quality impacts to occur that would not occur if the pollutants were left in-stream;
- The permittee does not increase the concentration at the edge of the mixing zone, or at the point of discharge if a mixing zone is not allowed, as compared to the concentration in the intake water, unless the increased concentration does not cause or contribute to an excursion above an applicable water quality standard; and
- The timing and location of the discharge would not cause adverse water quality impacts to occur that would not occur if the identified intake pollutant were left instream.

Paired intake and effluent arsenic data are summarized in the table below. Intake water monitored at Sample Point 702 would ultimately be discharged at Outfall 002. Six out of eleven samples at 002 show a lower arsenic concentration in the effluent than the intake. A paired t-test was performed and showed no statistically significant increase in concentration from the source water. The discharge from outfall 002 does not appear to constitute a net discharge of arsenic and no limits are recommended at this time.

Paired Sampling for Arsenic		
Date	Intake (702)	Effluent (002)
01/23/2018	1.1	1.3
01/25/2018	0.72	0.82
01/29/2018	0.92	0.74
01/31/2018	0.83	1.2
02/02/2018	0.80	0.64
02/06/2018	0.70	0.60
02/08/2018	0.51	0.40
02/12/2018	0.88	0.64
02/14/2018	0.76	0.87
02/15/2018	0.80	1.3
02/16/2018	0.91	0.67

Mercury

Similarly, mercury monitoring data at Outfall 002 shows that the mercury concentrations in the effluent from these outfalls are lower than intake concentrations. Therefore, no mercury limits are recommended at Outfall 002.

Mean Intake 709	Mean Outfall 002
0.57 ng/L	0.536 ng/L

Because process wastewater is discharged at Outfalls 004 and 009, the terms in NR 106.06(6) Wis. Adm. Code are not met for these dischargers and limits are required. Alliant Energy has requested a continued mixing zone for mercury. This request is addressed in Attachment 2. Accordingly, a daily max limit of 7.3 ng/L should be included at both outfalls 004 and 009 in the reissued permit.

Arsenic Variance for Outfalls 004 and 009

An arsenic limit is needed at Outfall 004 because the 30-day P_{99} of effluent data exceeds the calculated limit. Alliant Energy has submitted an application for an arsenic variance at Outfall 004 where coal pile runoff will be discharged. The low volume wastewater previously routed to the ponds will be occasionally discharged to Outfall 009. Because this process wastewater is routed to Outfall 009, this discharge may potentially contain a source of arsenic, and an arsenic variance will also be needed at this outfall.

If the variance is approved, an initial limit of **5.1 µg/L expressed as a daily maximum** limit is recommended in the reissued permit. This limit is set equal to the 1-day P_{99} of Outfall 004 effluent data collected from 2017-2019. There is not sufficient arsenic data from Outfall 009 to determine an appropriate limit. Because the same LVWW previously discharged via Outfall 004 will be periodically discharged at Outfall 009, the same 5.1 µg/L limit is recommended until sufficient data is available to determine an appropriate limit.

In the absence of a variance, a monthly average limit of 0.2 µg/L would apply. A respective mass limit and a daily max limit to meet the expression of limits requirements outlined in s. NR 106.07 Wis. Adm. Code would also be required.

Sulfate

The discharge of LVWW at Outfall 009 will periodically include demineralizer regeneration water (until the facility finalizes the evaluation and engineering of a system that will not require regeneration). Because of the sulfuric acid used at the facility, this regeneration water contains high levels of sulfate. Available sample results are summarized below. However, this waste stream makes up a relatively small portion of the total discharge from Outfall 009 (about 63 gpm, max 200 gpm, in a total average flow of 165 MGD). When combined with the other waste streams, sulfate concentrations at Outfall 004 are expected to be <3 mg/L.

No water quality criteria or secondary values are currently available for sulfate discharges to Lake Michigan. Based on a brief review of the available aquatic toxicity data, if a secondary value were to be calculated for sulfate, it would be much higher than the expected discharge levels. Therefore, no limits for sulfate are recommended.

	Demineralizer Regeneration Water	Estimated Effluent Concentration (Outfall 009)
01/14/2019 9:30 AM	1195 mg/L	0.657 mg/L
01/14/2019 10:15 AM	1938 mg/L	1.07 mg/L
01/14/2019 11:30 AM	1734 mg/L	0.953 mg/L

PAH Group of 10 at Outfall 014

Point source wastewater discharges containing PAH compounds are regulated using the best professional judgement (BPJ) technology-based limitation. Compliance can be demonstrated by a no-detect of all PAH compounds or by reporting the sum of the PAH group of 10 detected amounts to be equal to or less than 0.1 µg/L. An alternate method for summing PAH compounds using a toxicity equivalency factor (TEF) from guidance document: *PAH Group of 10 Calculation Using Toxicity Equivalent Factors* is recommended to measure compliance with this limit.

Effluent PAH monitoring data from 2013 to 2018 is summarized below. The average of the effluent data is less than 0.1 µg/L and no PAH limits are recommended in the reissued permit.

Outfall 014 - Total PAH (µg/L)	
09/18/2013	0.0292
07/02/2014	0.0267
10/06/2016	0.107
05/09/2017	0.0100
05/31/2018	0.0073
Average	0.0300

PART 3 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR AMMONIA NITROGEN

Four ammonia nitrogen samples were taken with the permit application at Outfalls 002, 004, and 009. Ammonia was not detected at any of the outfalls. These levels are well below the most restrictive limits that would be calculated. Therefore, no ammonia limits or increased monitoring is recommended in the reissued permit.

	Nitrogen, Ammonia mg/L		
Sample Date	Outfall 002	Outfall 004	Outfall 009
10/16/2017	< 0.25	< 0.25	< 0.25
10/19/2017	< 0.25	< 0.25	< 0.25
10/23/2017	< 0.25	< 0.25	< 0.25
10/26/2017	< 0.25	< 0.25	< 0.25

PART 4 –PHOSPHORUS

Technology Based Effluent Limit (TBEL)
Wisconsin Administrative Code, ch. NR 217, requires industrial facilities that discharge greater than 60 pounds of Total Phosphorus per month to comply with a Monthly Average limit of 1.0 mg/L, or an approved Alternative Concentration Limit. The current permit for the Edgewater Generating station contains a technology-based phosphorus limit of 1.0 mg/L monthly average at Outfall 004. This limit remains applicable unless a more stringent concentration limit is given.

Phosphorus – Water Quality Based Limits
Revisions to the administrative rules for phosphorus discharges took effect on December 1, 2010. These rule revisions include additions to ch. NR 102, Wis. Adm. Code, (s. NR 102.05, Wis. Adm. Code,), which establish phosphorus standards for surface waters. Revisions to ch. NR 217, Wis. Adm. Code, (s. NR 217, Subchapter III) establish procedures for determining water quality based effluent limits for phosphorus, based on the applicable standards in ch. NR 102, Wis. Adm. Code.

Section NR 102.06(5)(b), Wis. Adm. Code, specifies a total phosphorus criterion of 7 µg/L (0.007 mg/L) for the open and nearshore waters of Lake Michigan. For discharges directly to the Great Lakes, s. NR 217.13(4), Wis. Adm. Code, says that the Department shall set effluent limits consistent with nearshore or whole lake models approved by the Department. At this time there is no model available. According to phosphorus implementation guidance, an interim limit should be set at a level that's achievable and that makes progress toward phosphorus reductions without the investment of temporary treatment or a compliance schedule to meet the interim limit.

Effluent Data
The following table summarizes effluent total phosphorus monitoring data from after the recent facility changes: May 2018 to December 2019.

	Phosphorus mg/L
1-day P_{99}	0.59
4-day P_{99}	0.32
30-day P_{99}	0.15
Mean	0.077
Std	0.14
Sample size	24
Range	<0.0074 - 0.62

An interim limit of 0.60 mg/L expressed as a monthly average according to the suggested limit in s. NR 217.13(4) is recommended in the reissued permit. Interim phophorus limits are typically set equal to the 4-day P_{99} value. However, due to the small set of effluent data available, and considering that effluent concentrations could vary significantly with the intake water concentration, more flexibility in the interim limit is warranted.

PART 5 –THERMAL

New surface water quality standards for temperature took effect on October 1, 2010. These new regulations are detailed in chs. NR 102 (Subchapter II – Water Quality Standards for Temperature) and NR 106 (Subchapter V – Effluent Limitations for Temperature) of the Wisconsin Administrative Code. Daily maximum and weekly average temperature criteria are available for the 12 different months of the year depending on the receiving water classification.

In the July 13, 2011 limits evaluation, it was determined that daily max and weekly average temperature limits were needed at Outfalls 002 and 009 for all months of the year. A thermal mixing zone study was submitted in April 2010. Using the CORMIX model, it was found that thermal mixing zones were smaller than 71.74 acres in all months except October and November. The permit was issued with a compliance schedule to meet these temperature limits in October and November.

In June of 2016 (updated August 2016), the facility submitted a request for Alternative Effluent Limitations (AEL) which proposed heat limits for October and November. The permit was modified in 2016 to replace the temperature limits for October and November with heat load limits, which remain in the facility's current permit.

With the 2018 permit application, Alliant Energy submitted a thermal mixing zone study evaluating the operation of Unit 5 alone in preparation for when Unit 4 was retired later in 2018. The study found that all temperature limits would be met within the maximum 71.74 acre mixing zone in all months once Unit 4 is retired.

Considering this, it's recommended that the **October and November heat limits applied at surrogate Outfall 029 be removed from the permit now that Unit 4 is officially retired.** This is contingent upon the Department approval of Alliant Energy's most recent thermal mixing zone study.

PART 6 – WHOLE EFFLUENT TOXICITY (WET)

WET testing is used to measure, predict, and control the discharge of toxic materials that may be harmful to aquatic life. In WET tests, organisms are exposed to a series of effluent concentrations for a given time and effects are recorded. The following evaluation is based on procedures in the Department's WET Program Guidance Document (revision #11, dated November 1, 2016).

- Acute tests predict the concentration that causes lethality of aquatic organisms during a 48 to 96-hour exposure. To assure that a discharge is not acutely toxic to organisms in the receiving water, WET tests must produce a statistically valid LC_{50} (Lethal Concentration to 50% of the test organisms) greater than 100% effluent.

- Chronic tests predict the concentration that interferes with the growth or reproduction of test organisms during a seven-day exposure. To assure that a discharge is not chronically toxic to organisms in the receiving water, WET tests must produce a statistically valid IC_{25} (Inhibition Concentration) greater than the instream waste concentration (IWC). The IWC is 9.1% based on dilution of 10 parts lake water to 1-part effluent to calculate the IWC.

- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), a synthetic (standard) laboratory water may be used as the dilution water and primary control in acute WET tests, unless the use of different dilution water is approved by the Department prior to use. The primary control water must be specified in the WPDES permit.

- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), receiving water must be used as the dilution water and primary control in chronic WET tests, unless the use of different dilution water is approved by the Department prior to use. The dilution water used in WET tests conducted on Outfalls 004 and 009 shall be a grab sample collected from the receiving water location, upstream and out of the influence of the mixing zone and any other known discharge. The specific receiving water location must be specified in the WPDES permit.

- Shown below is a tabulation of all available WET testing data for Outfall 004. Efforts are made to ensure that decisions about WET monitoring and limits are made based on representative data. Data which is not believed to be representative of the discharge is not included in reasonable potential calculations. The table below differentiates between tests used and not used when making WET determinations.

WET Data History – Outfall 004

Date Test Initiated	Acute Results LC_{50} %				Chronic Results IC_{25} %			
	C. dubia	Fathead minnow	Pass or Fail?	Used in RP?	*C. dubia*	Fathead Minnow	Pass or Fail?	Use in RP?
06/22/2000	>100	>100	Pass	Yes	>100	>100	Pass	Yes
01/20/2004	>100	>100	Pass	Yes	>100	>100	Pass	Yes
04/12/2005	>100	>100	Pass	Yes	>100	>100	Pass	Yes
07/25/2006	>100	>100	Pass	Yes	>100	**66.5**	Pass	Yes
10/16/2007	>100	>100	Pass	Yes	>100	>100	Pass	Yes
01/22/2008	>100	>100	Pass	Yes	>100	>100	Pass	Yes
05/12/2009	>100	>100	Pass	Yes	>100	**67.9**	Pass	Yes
03/30/2010	>100	>100	Pass	Yes	>100	>100	Pass	Yes
07/16/2013	>100	>100	Pass	Yes	>100	**86.3**	Pass	Yes
12/02/2014	>100	>100	Pass	Yes	>100	>100	Pass	Yes
03/10/2015	>100	>100	Pass	Yes	**41.7**	>100	Pass	Yes
06/07/2016	>100	>100	Pass	Yes	>100	**83.2**	Pass	Yes
08/15/2017	>100	>100	Pass	Yes	>100	>100	Pass	Yes
11/29/2018	>100	>100	Pass	Yes	>100	>100	Pass	Yes

WET reasonable potential is determined by multiplying the highest toxicity value that has been measured in the effluent by a safety factor, to predict the likelihood (95% probability) of toxicity occurring in the effluent above the applicable WET limit. The safety factor used in the equation changes based on the number of toxicity detects in the dataset. The fewer detects present, the higher the safety factor, because there is more uncertainty surrounding the predicted value. WET limits must be given, according to s. NR 106.08(6), Wis. Adm. Code, whenever the applicable Reasonable Potential equation results in a value greater than 1.0.

According to s. NR 106.08(6)(d), TUa effluent values are equal to zero whenever toxicity is not detected (i.e. when the LC50. IC25 or IC 50 ≥ 100%.)

Acute Reasonable Potential = 0 < 1.0, Acute reasonable potential is not shown

Chronic Reasonable Potential = [(TUc effluent)(B)(IWC)]

TUc (maximum) 100/IC25	**B** (multiplication factor from s. NR 106.08(5)(c), Wis. Adm. Code, Table 4)	IWC
100/41.7 = 2.40	2.3 Based on 5 detects	9.1%

[(TUc effluent)(B)(IWC)] = 0.50 < 1.0, Chronic reasonable potential is not shown

Reasonable potential is not shown for chronic WET at Outfall 004 using the procedures in s. NR 106.08(6) and representative data from 2000 to 2017. No WET limits are required.

The WET Checklist was developed to help DNR staff make recommendations regarding WET limits, monitoring, and other permit conditions. The Checklist steps the user through a series of questions that evaluate the potential for effluent toxicity. The Checklist indicates whether acute and chronic WET limits are needed, based on requirements specified in s. NR 106.08, Wis. Adm. Code, and recommends monitoring frequencies based on points accumulated during the Checklist analysis. As toxicity potential increases, more points accumulate, and more monitoring is recommended to ensure that toxicity is not occurring. The completed WET Checklist recommendations for this permittee are summarized in the table below. Staff recommendations, based on the WET Checklist and best professional judgment, are provided below the summary table. For guidance related to RP and the WET Checklist, see Chapter 1.3 of the WET Guidance Document: http://dnr.wi.gov/topic/wastewater/WETguidance.html.

WET Checklist Summary

Outfall 009		
	Acute	**Chronic**
AMZ/IWC	Not Applicable. **0 Points**	IWC = 9.1 %. **0 Points**
Historical Data	No test data available from the last 5 years **5 Points**	No test data available from the last 5 years **5 Points**
Effluent Variability	Little variability, no violations or upsets, consistent operations. **0 Points**	Same as Acute. **0 Points**
Receiving Water Classification	Full Fish & Aquatic Life **5 Points**	Same as Acute. **5 Points**
Chemical-Specific Data	Limits for zero substances based on ATC; Detected in effluent: As, Cd, Cr3+, Cu, Pb, Hg, Ni, Zn, and Cl- (3 pts) Additional Compounds of Concern: Sb, Se, Si and Tl detected (2 pts) **5 Points**	Limits for zero substances based on CTC; Detected in effluent: As, Cd, Cr3+, Cu, Pb, Hg, Ni, Zn, and Cl- (3 pts) Additional Compounds of Concern: Sb, Se, Si and Tl detected (2 pts) **5 Points**

Outfall 009		
	Acute	**Chronic**
Additives	No additives **0 Points**	No additives **0 Points**
Discharge Category	Steam Electric Power Generating **5 Points**	Same as Acute. **5 Points**
Wastewater Treatment	Solely noncontact cooling water, boiler blowdown, and condensate during normal operations **0 Points**	Same as Acute. **0 Points**
Downstream Impacts	Not applicable **0 Points**	Same as Acute. **0 Points**
Total Checklist Points:	**20 Points**	**20 Points**
Recommended Monitoring Frequency (from Checklist):	2 tests during permit term (year 2, 4, 6, etc.)	2 tests during permit term (year 2, 4, 6, etc.)
Limit Required?	No	No
TRE Recommended? (from Checklist)	No	No

Based on the checklist point totals alone, 2x permit term acute and chronic testing would be recommended. However, the discharge is usually solely noncontact cooling water with no additives. Low volume wastewater is currently discharge intermittently, but it makes up a very small percentage of the total discharge and is unlikely to impact a toxicity test. Once the facility switches polishing systems, low volume wastewater will not be routed to Outfall 009 at all. Considering this, no WET testing is recommended at Outfall 009.

Since decommissioning of Unit 4, the discharge from Outfall 002 only consists of pump testing and emergency discharges. Considering this, WET monitoring is not recommended at Outfall 002.

Outfall 004		
	Acute	**Chronic**
AMZ/IWC	Not Applicable. **0 Points**	IWC = 9.1 %. **0 Points**
Historical Data	14 tests available No tests failed. **0 Points**	14 tests available No tests failed. **0 Points**
Effluent Variability	Little variability, no violations or upsets, consistent operations. **0 Points**	Same as Acute. **0 Points**
Receiving Water Classification	Full Fish & Aquatic Life **5 Points**	Same as Acute. **5 Points**
Chemical-Specific Data	Limits for zero substances based on ATC; As, Cd, Cr3+, Cu, Pb, Hg, Ni, Zn, and Cl- detected in the effluent (3 pts)	Limits for zero substances based on CTC; As, Cd, Cr3+, Cu, Pb, Hg, Ni, Zn, and Cl- detected in the effluent (3 pts)

Attachment #1

Outfall 004		
	Acute	**Chronic**
	Additional Compounds of Concern: Sb, Se, Si and Tl detected (2 pts) **5 Points**	Additional Compounds of Concern: Sb, Se, Si and Tl detected (2 pts) **5 Points**
Additives	0 Biocides and 9 Water Quality Conditioners added. SorbX-100 Used: No **9 Points**	6 of the additives are used more than once per 4 days. **6 Points**
Discharge Category	Steam Electric Power Generating **5 Points**	Same as Acute. **5 Points**
Wastewater Treatment	Primary Treatment Only **8 Points**	Same as Acute. **8 Points**
Downstream Impacts	Not applicable **0 Points**	Same as Acute. **0 Points**
Total Checklist Points:	**32 Points**	**29 Points**
Recommended Monitoring Frequency (from Checklist):	3 tests during permit term (year 1, 3, 5, etc.)	3 tests during permit term (year 1, 3, 5, etc.)
Limit Required?	No	No
TRE Recommended? (from Checklist)	No	No

The point totals in the WET checklist correspond to 3x permit term acute and chronic monitoring. However, a minimum of annual monitoring is required because the Edgewater Generating Station is in a primary industrial category. Following the guidance provided in the Department's WET Program Guidance Document (revision #11, dated November 1, 2016), **annual acute and annual chronic WET testing is recommended** in the reissued permit. Tests should be done in rotating quarters, to collect seasonal information about this discharge. WET testing shall continue after the permit expiration date (until the permit is reissued).

PART 7 – ADDITIVES

The following additive product and usage information was submitted with the permit application. Additives which have not previously been approved in the current permit are reviewed at this time.

Outfall 004[1]

Additive Name	Manufacturer	Purpose of Additive including where added	Intermittent or Continuous Feed	Max Usage Rate (lbs/day)	Max Effluent Conc. Possible (mg/L)	Secondary Acute Value (mg/L)[2]
RL 2016 (Citric acid)	ChemTreat	Reverse Osmosis Clean-in-Place Chemical	Intermittent	36	0.49	125
RL 1700	ChemTreat	Reverse Osmosis Clean-in-Place Chemical	Intermittent	36	0.49	7.07
RL 124 (Sodium bisulfite)	ChemTreat	Reverse Osmosis Dechlorination	Intermittent	20	0.27	(no review needed)[1]
RL 9917	ChemTreat	Reverse Osmosis Antiscalant	Intermittent	20	0.27	245
Sulfuric Acid 66 DEG	Hydrite	Demineralizer Regeneration	Intermittent	477		(no review needed)[1]
Sodium Hydroxide 97%	Sigma Aldrich	Unit 5 Boiler Water Startup pH Control	Intermittent, switching to continuous	2.5		(no review needed)[1]
Sodium Hydroxide 50%	Hydrite	Demineralizer Regeneration	Intermittent	568		(no review needed)[1]
BL1795 Tri Sodium Phosphate	ChemTreat	Unit 5 Boiler Water pH Control	Continuous	0.13	0.0018	15
Ammonium Hydroxide 19%	Hydrite	Unit 5 Boiler Feedwater pH Control	Continuous	167	Consumed	(no review needed)[1]

1. Additives currently discharged at Outfall 004 have the potential to be discharged at Outfall 009 in the future. Maximum discharge concentrations for discharge from 009 would be lower than those listed in the table.
2. Calculated based on toxicity data provided
3. Evaluation are not necessary for additives that have active ingredients consisting only of chlorine, caustic soda (sodium hydroxide), hypochlorite, sulfuric acid, hydrochloric acid (see part 10e or permit application)

The facility also utilizes CL2875, CL4125, CL6034 and Sodium Nitrate 41%, but they are only added to the closed loop system. No additive review and secondary value is needed for these additives.

Comparing the maximum possible discharge concentration for each product to the potential use restriction shows little to no potential for toxicity effects from these additives. The use of RL 2016, RL 1700, RL 9917, and BL 1795 may be authorized in the reissued permit at these maximum usage rates.

No aquatic toxicity data is available for the ammonium hydroxide formulation used for pH treatment in the Unit 5 feedwater. Residual of this product has been measured at 0.3 mg/L in the blowdown from these units. Following the process wastewater treatment system, any ammonium hydroxide should be completely consumed. This additive is not expected in the discharge and a secondary value is not calculated for this product.

Attachment #2

Mixing Zone Phase-Out Exception for Mercury
For Wisconsin Power and Light Edgewater Generating Station

The Wisconsin Power and Light Edgewater Generating Station (EDG) has requested a continued exception to the mixing zone phase out when calculating effluent limitations for mercury beyond November 15, 2010 under the exception for technical and economic considerations to the mixing zone phase-out for bioaccumulating chemicals of concern (BCC's) in s. NR 106.06(2)(br) Wis. Adm. Code. In consideration of the requirements contained at the above reference, the Wisconsin Department of Natural Resources (WDNR) determines that:

- EDG is in compliance with and will continue to comply with the WPDES permit requirements and all applicable requirements in ch. NR 106 Wis. Adm. Code.

- The discharger has reduced and will continue to reduce, to the maximum extent possible, its discharge of mercury. EDG will accept a permit compliance schedule requiring the development and implementation of a Mercury Pollution Minimization Plan (PMP) meeting the requirements of s. NR 106.145(7) Wis. Adm. Code. WDNR believes the finding at s. NR 106.145(1)(a) Wis. Adm. Code sufficiently demonstrates that controls beyond a PMP would result in unreasonable economic effects because controls to remove mercury using wastewater treatment technology are not feasible or cost-effective.

- EDG discharges directly to Lake Michigan. There is currently no applicable TMDL for mercury in this waterbody. Available data indicate the concentration of mercury in the receiving water is 0.57 ng/L, which is below the applicable water quality criteria. The background concentration used is based on EDG's intake sample results taken from November 2012 to August 2017.

- There have not previously been effluent mercury limitations included in the EDG wastewater permits (WI-0001589).

- The mixing zone shall be no larger than necessary to account for the technical constraints and economic effects identified pursuant to this exception. Therefore, the mixing zone shall be set at 4:1 based on the 30-day P_{99} of discharge 3.12 ng/L, the criterion of 1.3 ng/L, and a background concentration of 0.57 ng/L in Lake Michigan.

- The daily maximum limit is set at the 1-day P_{99} of Outfall 004 monitoring data of 7.3 ng/L based on department discretion. There is not sufficient mercury data from Outfall 009 to determine an appropriate limit. Because the same LVWW previously discharged via Outfall 004 will be discharged at Outfall 009, the same 7.3 ng/L limit is recommended until sufficient data is available to determine an appropriate limit.

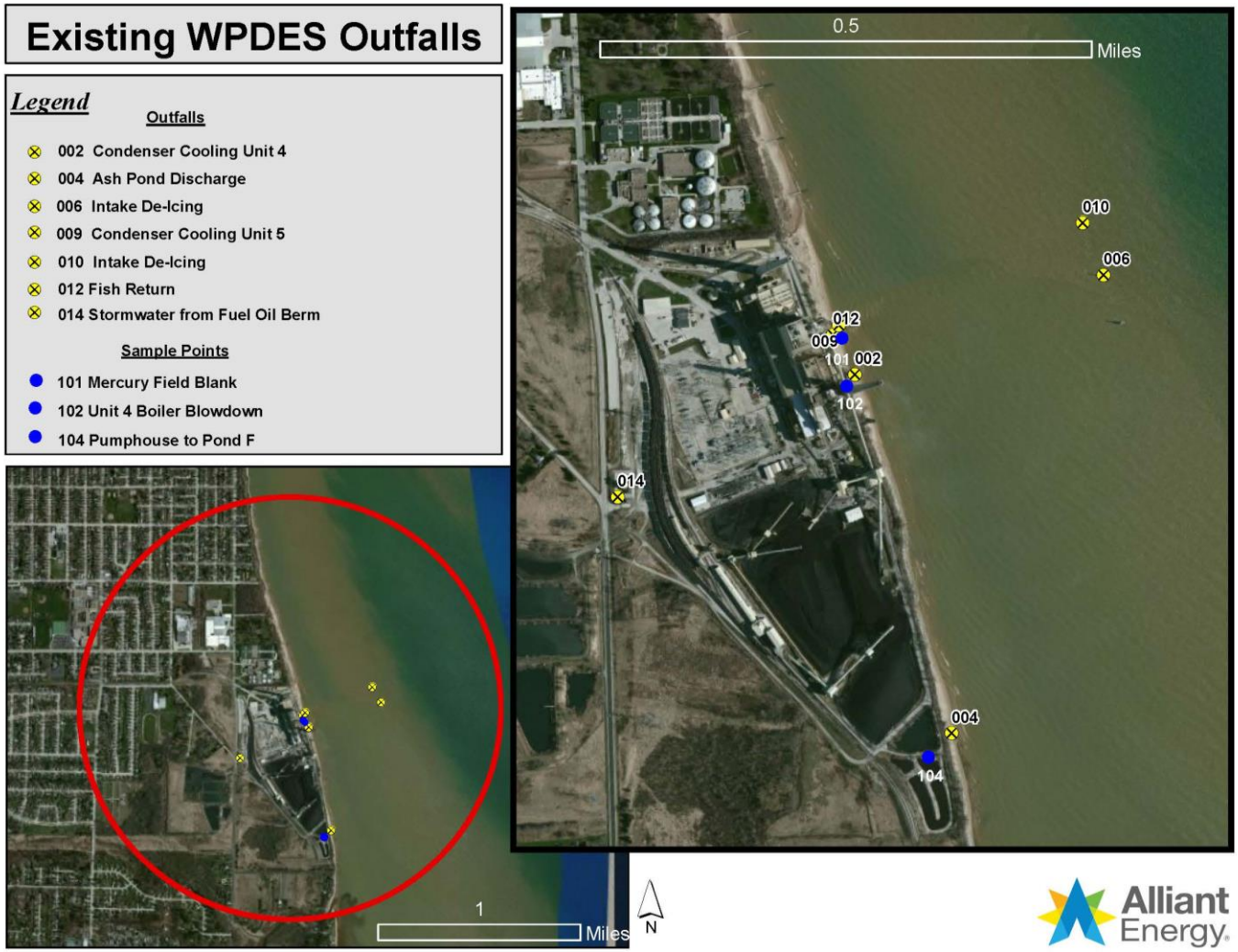
Therefore, WDNR grants an exception to the phaseout of the use of a mixing zone for effluent discharges from the wastewater treatment facility operated by the EDG due to technical and economic considerations. The granting of this exception to the EDG shall apply only to the 5-year permit term of the proposed WPDES permit. The permittee will need to make a similar request and DNR will need to make a similar determination for a further continuation of a mixing zone, if those actions become appropriate for the next permit term.

Attachment #3

Arsenic Monitoring Results (ug/L)

Dates	Intake Data (Sampling Point 702)	Intake Data (Sampling Point 709)	Outfall 004
10/26/2012			2.2
10/30/2012	2.2		2.5
11/01/2012	1.1		2.1
11/06/2012	0.96		2.2
11/08/2012	0.94		1.9
11/13/2012	0.9		1.9
11/15/2012	0.92		1.9
11/20/2012	0.95		2.0
11/27/2012	0.9		1.6
11/29/2012	0.9		1.5
12/04/2012	0.75		1.5
01/02/2013			1.4
02/04/2013			1.6
03/05/2013			1.4
04/02/2013			1.1
06/05/2013			2.6
10/16/2017	0.85		2.2
01/23/2018	1.1	1	
01/25/2018	0.72	0.79	
01/29/2018	0.92	0.97	
01/31/2018	0.83	0.99	
02/02/2018	0.8	0.76	
02/06/2018	0.7	0.64	
02/08/2018	0.51	0.76	
02/12/2018	0.88	0.83	
02/14/2018	0.76	0.84	
02/15/2018	0.8	1	
02/16/2018	0.91	0.79	
06/03/2018			1.9
07/05/2018			1.8
08/01/2018			1.6
09/10/2018			1.4
10/08/2018			2.5
11/05/2018			1.6
12/14/2018			1.3
01/08/2019			1.1
02/04/2019			1.1
03/05/2019			2.1
04/02/2019			2.6
05/14/2019			1.5
06/03/2019			1.6
07/01/2019			4.7
08/06/2019			3.3
09/09/2019			3.4
10/08/2019			2.2

Attachment #4
Site Map



Attachment 5: Mercury Mixing Zone Phase Out Exception

Attachment 15 of EDG's permit reissuance application requested variance documentation previously submitted remain in effect. The documentation on file for this permittee regarding mercury variances includes:

- Mercury Pollutant Minimization Plan (PMP) dated July 2009
- Letter requesting to use mixing zone for calculation of mercury limits dated September 30, 2009

As part of the Great Lakes Initiative (GLI) regulations in 40 CFR 132 Appendix F Procedure 5.E.3.a. states that as of March 23, 2007, a permit may not authorize a "no net addition limitations" for pollutants. In accordance with 40 CFR 132 Appendix F Procedure 3.C.4. permits issued on or after November 15, 2010 shall not authorize mixing zones for existing discharges of bioaccumulative contaminants of concern (BCCs), with a few exceptions. 40 CFR 132 Appendix F Procedures 3.C.6. provides an exception for technical and economic considerations. The department has similar provisions listed in s. NR 106.06(2)(br), Wis. Adm. Code.

In granting the exception, the department determines that:

a. The permittee is in compliance with and will continue to comply with the WPDES permit requirements and all applicable requirements in ch. NR 106, Wis. Adm. Code.

b. The discharger reduced and will continue to reduce the loading of mercury to the maximum extent possible.

   The WPDES permit includes a compliance schedule requiring the development and implementation of a Mercury Pollutant Minimization Plan (PMP) that satisfies the requirements of s. NR 106.145(7), Wis. Adm. Code. The department believes the findings listed in s. NR 106.145(1)(a), Wis. Adm. Code sufficiently demonstrate that controls beyond a PMP would result in unreasonable economic effects because controls to remove mercury using wastewater treatment technology are not feasible or cost-effective. Since installing the dry bottom ash system, mercury levels have decreased by 94% in the discharge.

Any approved mixing zone for a BCC shall:

a. Not be larger than necessary to account for the technical constraints and economic effects.

   The mixing zone shall be set at 4:1 based on the 30-day P99 of 3.12 ng/L, the criterion of 1.3 ng/L, and a background concentration of 0.57 ng/L in Lake Michigan. The 4:1 ratio is less than the 10:1 ratio allowed under s. NR 106.06(4)(b)2., Wis. Adm. Code for calculating limits where the receiving water does not exhibit a unidirectional flow at the point of discharge.

b. Require all water quality criteria or secondary values for the BCC be met at the edge of an approved mixing zone or be consistent with the applicable US EPA approved TMDL.

   EDG discharges directly to Lake Michigan. There is no current or applicable TMDL for mercury in this waterbody. Available data indicate the concentration of mercury in the receiving water is 0.57 ng/L, which is

below the applicable water quality criteria of 1.3 ng/L. The background concentration used is based on EDG's water intake sample results from November 2014 to August 2017.

c. Contain a numeric effluent limit for the BCC, determined using the requirements of sub. (4). The limit shall not be less stringent than the limit that was effective on November 6, 2000.

Mercury effluent limits have not been included in any of EDG's previous WPDES permits under WPDES Permit No. WI-0001589. The daily maximum limit is set at the 1-day P99 of Outfall 004 monitoring data of 7.3 ng/L based on department discretion. There is not sufficient mercury data from Outfall 009 to determine an appropriate limit. Because the same LVWW previously discharge via Outfall 004 may be discharged at Outfall 009, the same 7.3 ng/L is recommended until sufficient data is available to determine a more appropriate limit.

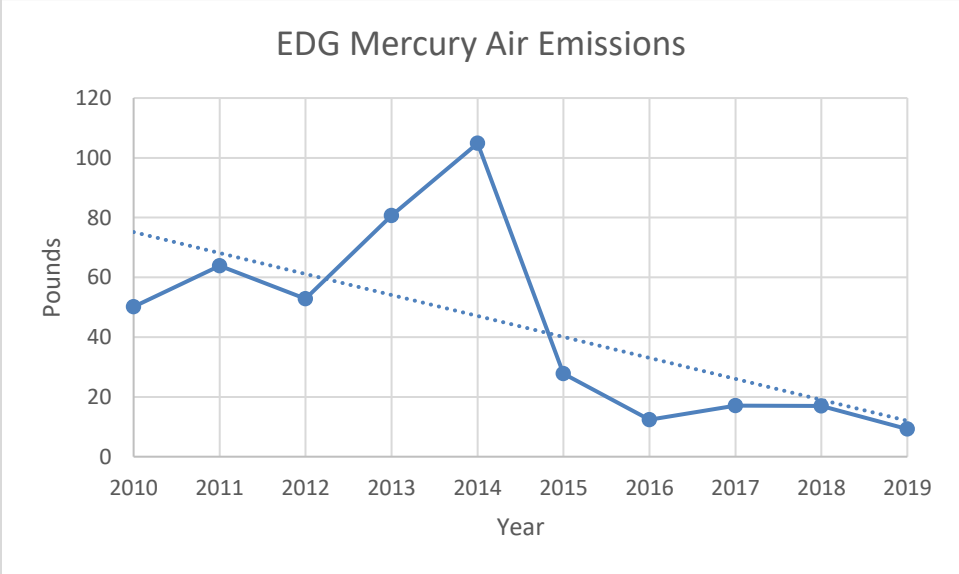
d. Include a permit condition requiring the permittee to implement an ambient monitoring plan if the department determines these requirements are appropriate to ensure compliance with water quality criteria and consistency with any applicable TMDL.

The permit requires EDG to sample influent mercury at its surface water intakes to determine the amount of mercury originating from Lake Michigan and contributing to EDG's discharges.

e. Include a permit requirement for an evaluation of alternative means for reducing the BCC from other sources in the watershed if the department determines these requirements are appropriate to ensure compliance with water quality criteria and consistency with any applicable TMDL.

The department determined that this requirement is not appropriate. EDG has the most control over its own operations and can have the greatest impact by minimizing contributing sources under its control, such as minimizing mercury deposition through air pollution controls. Lake Michigan is such a vast waterbody that other contributions in the watershed that the permittee could control are unlikely to change background levels of mercury in the receiving water. The following table and chart show the pounds of mercury per year reduced from EDG's air handling system.

Year	Mercury (pounds/year)
2010	50.18
2011	63.88
2012	52.85
2013	80.69
2014	104.85
2015	27.74
2016	12.36
2017	17.06
2018	16.99
2019	9.24



f. Be limited to one permit term unless the permittee applies for a mixing zone approval at the next reissuance and the department approves the mixing zone in subsequent permit applications in accordance with the requirements of this paragraph.

g. The corresponding fact sheet for an approved mixing zone shall specific the mixing provisions used in calculating the permit limits and shall identify each BCC for which a mixing zone is approved.

The items listed above specify the mixing provisions used to calculate permit limits. The BCC for this mixing zone is for mercury.

Attachment 6: Temperature Alternative Effluent Limitation (AEL)

I. BACKGROUND

Each permit reissuance, the department reviews the permittee's discharge data and recalculates limits to be protective of water quality using the latest procedures and code requirements. Water quality standards for temperature are contained in subch. II ch. NR 102, Wis. Adm. Code. Procedures for calculating temperature limits are contained in subch. V, ch. NR 106, Wis. Adm. Code. As part of the 2018 permit reissuance application, EDG submitted a mixing zone study evaluating the thermal discharge solely from Unit 5 operations because Unit 4 was scheduled to be retired later in 2018.

EDG is located on the south side of Sheboygan, Wisconsin, on the western shore of Lake Michigan. The facility has one operational unit (Unit 5) with a nameplate capacity of 380 megawatts. The unit uses once-through condenser cooling system where water is withdrawn through an offshore intake structure and discharged through Outfalls 009 and 010. Due to Unit 4 retiring in September 2018, the thermal mixing zone is expected to be much smaller because heat loading will be reduced by 46% compared to when both Units 4 and 5 were operating. Consequently, a new mixing zone study was conducted to determine if the thermal discharge for Unit 5 alone would meet the 71.74 acre (3,125,000 sq. ft.) mixing zone limit for a shore discharge into a Great Lake in accordance with s. NR 106.55(7)(b), Wis. Adm. Code.

Stormwater, demineralizer regeneration wastewater, coal pile runoff, and slag dewatering wastewater are discharged at Outfall 004. The discharge at Outfall 004 is much smaller than Outfall 009 (8.6 MGD vs. 175 MGD respectively) and is considered insignificant compared to the size and temperature of the discharge at Outfall 009. EDG submitted a report addressing thermal discharge from Outfall 009. The report did not address Outfall 004. The report is titled Thermal Mixing Zone Study for Unit 5 of the Edgewater Generating Station and is dated February 20, 2017.

II. OUTFALL 009 MIXING ZONE STUDY

WPL requested a site specific mixing zone in accordance with s. NR 106.55(10), Wis. Adm. Code. WPL contracted with Burns & McDonnell Engineering Company, Inc. to conduct the mixing zone study. The mixing zone study consisted of mapping the thermal discharge plume from Unit 5 using the mapped thermal discharge to validate the Cornell Mixing Zone Expert System discharge plume model (CORMIX), and then using CORMIX to predict the area of the mixing zones in Lake Michigan for each month under two wind directions (primary and secondary).

The thermal discharge plume from Unit 5 was mapped on October 22, 2016 from about 0840 to 1010. In the 3 hours immediately preceding the mapping period (0540-0840), the cooling water discharge temperature increased by approximately 11.5 °C and the discharge rate increased by 38,859 gpm. The plant incurred increases in temperature and flow rate due to increased electrical demand during these times. In addition, the winds were calm during the 11 hours prior to the mapping period. CORMIX could not fully model the discharge plume in stagnant ambient flow, and the changing discharge rate and temperature immediately preceding the mapping period was inconsistent with the CORMIX assumption of a steady-state system. These unanticipated factors resulted in a poor correlation between the CORMIX modeled plume and the mapped plume.

The poor correlation raises questions of whether modeling can be used. However, CORMIX has been validated though the many studies comparing modeled, field, and laboratory discharge plumes that have been published in peer review scientific literature. These studies have supported the use of CORMIX to predict mixing zone sizes for planned discharges for which calibration and validation are impossible. The results of the comparison between the observed and modeled thermal plumes for Unit 5 therefore don't invalidate the mixing zone area predictions made by CORMIX model.

For modeling the monthly mixing zone areas, modest ambient flows were part of the input data, and steady-state conditions were considered reasonable and conservative in that these conditions were likely to produce maximum mixing zone areas. As such, no changes were made to the monthly input data as a result of the validation analysis. The ambient temperatures used were the Wisconsin default temperatures, which are based on averages, and the discharge temperatures used were maximums. Because maximum discharge temperatures for once through cooled power plants occur when ambient temperatures are near maximum, the monthly heat loadings modeled averaged 1.5 times greater than the actual maximum Unit 5 heat loadings.

The modeled monthly mixing zone areas ranged from 0.07 acres in June at the primary wind direction to 36.48 acres for the secondary wind direction in November. The maximum modeled mixing zone area was only 51% of the 71.74 acre limit. This margin and the fact that the modeled heat loadings were greater than heat loadings that Unit 5 could actually generate support the contention that when operating alone, the Unit 5 thermal mixing zone will have no reasonable potential to exceed the 71.74 acre limit even though unusual ambient conditions at the time of the thermal plume mapping prevented the CORMIX model from being affirmatively validated. As such, no limits for temperature will be needed in the facility's discharge permit.

III. JUSTIFICATION OF APPROVAL

The department proposes to approve the site specific mixing zone in accordance with ss. NR 106.55(10) and NR 102.05(3), Wis. Adm. Code. Some of the specific aspects of the criteria for approval of the mixing zone and the department's determinations are as follows:

- s. NR 106.55(10)(a) the applicant has detailed the full extent and conditions of the mixing zone for Unit 5.

- s. NR 106.55(10)(b) the applicant has demonstrated that the mixing zone provisions of s. NR 102.05(3), Wis. Adm. Code will be met (see below).

- s. NR 106.55(10)(c) the department has determined that all aquatic life uses are attained with the temperature limitations proposed in the draft permit.

- s. NR 106.55(10)(d) the department has determined that the mixing zone provides protection equivalent or better than provided by temperature criteria of ch. NR 102, Wis. Adm. Code.

- s. NR 102.05(3)(a) the mixing zone is deemed to be as small as practicable. The department believes the expense of de-rating, modification of discharge structures, or changing to different cooling water technology is not practicable because of the cost compared to impact on the environment.

- s. NR 102.05(3)(b) the plume floats on the surface of the lake allowing passageway. The mixing zone at the facility originates at the shoreline and extends out into Lake Michigan. Plume mapping and modeling demonstrate that the horizontal extent of the plume leaves room for mobile aquatic organisms to avoid areas of sub-lethal temperatures. Plume mapping also demonstrated that the thermal plume floats on the surface of the lake, which allows a substantial passageway under the mixing zone.

- s. NR 102.05(3)(c) the mixing zone does not affect any river or stream.

- s. NR 102.05(3)(d) this requirement is not applicable because no acute values specified pursuant to s. NR 105.05, Wis. Adm. Code are affected by the mixing zone.

- s. NR 102.05(3)(e) this requirement is not applicable because Lake Michigan is not an inland lake.

- s. NR 102.05(3)(f) The plume has little impact on nursery or spawning areas or migratory routes and is located away from rivers. The substrate in the vicinity of the plume is mostly sand and rock. Entrainment sampling in 2006 and in 2009 did not indicate that the area is a significant spawning or nursery area. Some species of fish in Lake Michigan engage in spawning migrations up the streams and rivers that flow into the lake. The mouth of the Sheboygan River is near the plume so there is some possibility that the plume could interfere with migratory routes or spawning runs. Department fisheries experts do not anticipate any spawning or nursery area or migratory route around the plume would be significantly impacted by the thermal mixing zone.

- s. NR 102.05(3)(g) there are no other mixing zones are in the area.

- s. NR 102.05(3)(h) pH is not significantly affected by using water withdrawn from Lake Michigan for once through cooling water.

The purpose of water quality standards are to protect the designated uses of waterbodies receiving pollutants from effluents. The uses for Lake Michigan are listed in s. NR 104.25, Wis. Adm. Code and include recreation, commercial and recreational fishing, shipping, public water supply, waste assimilation, and industrial cooling water. In addition, Lake Michigan in the vicinity of EDG is classified as a trout water in s. NR 104.26, Wis. Adm. Code. There is no evidence indicating that the cooling water discharge from EDG has adversely impacted any of the designated uses of Lake Michigan. No temperature limits are recommended in the permit for either lethal or sublethal criteria based on the temperature limits and consideration of a site specific mixing zone.

IV. OUTFALL 004 CONSIDERATIONS

The discharge at Outfall 004 is sufficiently small such that no limits are needed for lethal or sublethal temperature criteria and therefore no temperature limits are included in the permit for Outfall 004.

Attachment 7: Arsenic Variance

I. BACKGROUND

The department reissued EDG's WPDES Permit No. WI-0001589-08-0 on July 1, 2013 which included water quality based arsenic limits of 0.2 ug/L at Outfall 004. In accordance with s. NR 283.15(2)(am)1., Wis. Stats., the permittee applied for a variance within 60 days of permit reissuance with a WQBEL. Due to the variance application, the limit and associated compliance schedule did not become effective. The department modified EDG's WPDES permit on October 1, 2016. Modifications included a thermal AEL and other small changes, but the department did not make a final determination on the arsenic variance application.

WPDES Permit No. WI-0001589-08-1 expired on June 30, 2018. The permittee submitted updated arsenic variance information to reflect some of the major changes occurring at the plant. This information is documented in a letter dated October 23, 2018. An arsenic pollutant minimization plan (PMP) was submitted on December 26, 2019.

The department proposes to approve the variance based the factor allowed under s. 283.15(4)(a)1.c., Wis. Stats., s. NR 200.20(2)(c), Wis. Adm. Code, and 40 CFR Part 132, Appendix F, Procedure 2.C.1.c. The factor (commonly referred to as a "Factor 3") states that human caused conditions or sources of pollution prevent the attainment of the standard and cannot be remedied or would cause more environmental damage to correct than to leave in place. Arsenic in Lake Michigan is both naturally occurring as well as human caused. Presently, the ability for available technologies to reliably treat arsenic down to 0.2 ug/L is relativity uncertain, yet very expensive in terms of both capital and O&M costs. Background levels in Lake Michigan, which is the source water for cooling and service water at the facility, exceeds the arsenic water quality standard of 0.2 ug/L. The installation and operation of a treatment system would not be expected to result in a measurable impact on the levels of arsenic in Lake Michigan. It would create adverse financial impacts on EDG's customers with little environmental benefit. The permittee has also submitted economic impact evaluation information.

Section NR 106.06(6), Wis. Adm. Code provides procedures for setting limits based on elevated background concentrations in the receiving water. Generally, an effluent limit may be set equal to the representative background concentration of the receiving water however there are two technicalities that prevent the permittee from obtaining an effluent limit equal to background concentrations in Lake Michigan.

1. Because there may periodically be a discharge of LVWW through Outfall 009, there may be a small addition of arsenic mass to the discharge. Section NR 106.06(6)(b)2., Wis. Adm. Code states that the permittee may not contribute any additional arsenic mass to its discharge to be eligible for an effluent limit equal to background arsenic concentrations in the receiving water.
2. Because the discharge is in the Great Lakes System. Section NR 106.06(6)(c)1., Wis. Adm. Code states that limits shall be set to the most stringent applicable water quality criterion which is 0.2 mg/L of arsenic for Lake Michigan.

II. ARSENIC REDUCTIONS OVER LAST PERMIT

This is a proposed first time arsenic variance, meaning that there were no previous permit requirements for the facility to reduce arsenic in its discharge. The actions were voluntary.

- Unit 3 Retirement
  - Unit 3 was retired in 2013

- This retirement reduced the overall flow to and from the WPDES Pond System through the elimination of LVWW such as slag sluicing, service water used for Unit 3 operations, and other wastewater associated with production of steam grade water.
- This unit retirement reduced the withdrawal of water from Lake Michigan.

- Unit 4 Retirement
  - Unit 4 retired on September 30, 2018
  - This retirement reduced the overall flow to and from the WPDES Pond System through the elimination of LVWW such as slag sluicing, service water used for Unit 4 operations, and other wastewater associated with production of steam grade water.
  - This unit retirement reduced the withdrawal of water from Lake Michigan.

- Unit 5 Dry Bottom Ash Installation
  - This system is completely dry and replaces a 1985 Hydrobin system, thereby eliminating the discharge of bottom ash transport water.

The operational changes and equipment installations reduced the overall arsenic concentration and mass discharged through Outfall 004 by 91% compared to baseline conditions when all three generating units were in operation. Refer to the October 23, 2018 submittal for more information. The table on the following page summarizes the source, flow, and concentration data to substantiate these reductions.

III. FUTURE CHANGES

The facility is looking at long-term operational planning for its remaining Unit 5 to support compliance with the Coal Combustion Residuals Rule, Effluent Limit Guidelines, and Water Quality Standards.

- WPDES Pond Closures
  - With Units 3 and 4 retired and Unit 5 being equipped with a dry bottom ash handling system, operation of the ponds is no longer needed. The coal combustion residual ponds are scheduled to be abandoned in 2020.
  - As part of the abandonment and closure process, the existing wastewater stored in these ponds will need to be discharged via Outfall 004. However, once the ponds are abandoned in 2020, ash handling wastewater will not be discharged at Outfall 004.
  - An arsenic variance will still be needed for Outfall 004 post pond closure due to the existing coal pile runoff discharged through Outfall 004. The facility intends to reduce the coal pile footprint and recirculate coal pile runoff for dust suppression.

- Unit 5 Low Volume Wastewater
  - On June 5, 2019, the facility received construction approval to reconfigure its piping of low volume wastewater so it can be reused in the Unit 5 Air Quality Control System (AQCS), where it will be consumed. However, there are situations when the LVWW can't be used in the AQCS and must be discharged. This discharge contingency will discharge through Outfall 009.
  - Although a majority of the wastewater discharged through Outfall 009 is non-contact cooling water with arsenic levels dependent on concentrations in Lake Michigan, a variance will be needed for this outfall since not all arsenic in the discharge originates from the Lake Michigan source water.

- Optimizing Coal Yard Storage
  - The permittee intends to reduce and redesign the cold yard storage area to improve stormwater management and minimize pollution from coal pile runoff with potential to reuse coal pile runoff for dust suppression.

IV. SOURCES OF ARSENIC

Remaining sources of arsenic at the facility include:

- Coal
  - Trace concentrations of arsenic are present in coal and depends on the type of coal being mined. Subbituminous coal is known to typically contain the lowest concentrations and EDG burns only subbituminous coal. Arsenic concentrations in the facility's coal have average 734 ug/kg since 2000.
  - Coal pile runoff which is discharged through Outfall 004 contains arsenic which is reflective of the arsenic concentration of the coal.

- Lake Michigan Intake Water
  - Water is withdrawn from Lake Michigan primarily for condenser cooling. Arsenic concentrations in Lake Michigan sampled at the intake averaged 1.05 ug/L. The water quality standard (WQS) for Lake Michigan is 0.2 ug/L. The maximum contaminant level (MCL) for public drinking water supplies is 10 ug/L.

- Steam-Grade Water Production
  - Water received from the City of Sheboygan (which is sourced from Lake Michigan) is processed through a RO and ion exchange demineralizer system to produce steam grade water. Reject water in sent to the WPDES system, which is intended to be reused in the Unit 5 AQCS but sometimes discharged through Outfall 009. Drinking water standards require arsenic be less than 10 ug/L, so it's highly probable that arsenic is present in the reject waste stream.
  - Boiler blowdown is also considered steam grade water. This water is separated from the WPDES system and discharged through Outfall 004, with contingencies to be used in the Unit 5 AQCS if needed.

In its 2018 arsenic variance application update, the permittee submitted flow and arsenic sampling data to predict arsenic loading from Outfall 004. It is summarized in the table below. This was not performed for Outfall 009 because it was not anticipated that a variance would be needed at Outfall 009 (due to assumed eligibility for intake credits). As shown in the table below, the concentration at Outfall 004 is estimated to exceed the 0.2 ug/L Lake Michigan WQS for arsenic, but is within the range of measured arsenic concentrations in Lake Michigan at the water intake which ranged from 0.75 ug/L to 2.2 ug/L.

Stream	Flow Rate (gpm)	Arsenic Concentration (ug/L)	Mass Loading (lb/day)	Mass Loading (lb/year)	Average Concentration to 004 (ug/L)	Total Mass to 004 (lb/year)
Unit 5 Bottom Ash Sump[1]	2	0.99	0.00002	0.009	0.6778	1.8964
Unit 5 Boiler Room Sump	485	0.66	0.00386	1.408		

Unit 5 Condensate Polisher Sump	13	0.28	0.00004	0.016		
Unit 5 Demin Sump	1	0.28	0.0000	0.002		
Unit 5 Turbine Room Sump	67	0.74	0.00059	0.217		
Unit 4 Boiler Room Sump[2]	30	1.37	0.00049	0.180		
Coal Pile Runoff	40	0.37	0.00018	0.065		

[1] Flow is from the bottom ash unloading area sump, which may end up in the Unit 5 bottom ash sump despite a berm separating the two areas. The 2 gpm flow is not continuous. The area is swept/vacuumed, then may be rinsed with water, which is where the 2 gpm flow comes from.

[2] Although Unit 4 is retired, demineralization/condensate polisher system and basement waters are still collected in this sump.

V. COST OF TREATMENT TECHNOLOGIES

Burns and McDonnel, the consultant for EDG, researched arsenic removal technologies to meet the 0.2 ug/L arsenic limit. They concluded that no technology exists to date that would ensure arsenic reductions consistently meet the 0.2 ug/L limit.

Of the potential treatment systems evaluated, it was determined that only a coagulation and filtration system MAY achieve a 0.20 ug/L total arsenic in the discharge from Outfall 004, but it could not be guaranteed that the 0.20 ug/L arsenic limit would be met.

Below is summary of the technologies evaluated and their costs.

Technology	**Capital Cost**	**Annual O&M Cost**	**Net Present Value (20 Yr Life Cycle)**	**Approx. Retail Customer Rate Impact**
Coagulation/Filtration	$ 14,363,000	$ 4,847,000	$ 91,907,000	0.53%
Lime Softening	$ 16,035,000	$ 8,615,000	$ 153,861,000	0.83%
Adsorptive Media (Blue PRO)	$ 12,446,000	$ 1,224,000	$ 32,028,000	0.24%
Ion Exchange	$ 25,038,000	$ 12,207,000	$ 220,330,000	1.20%
ABMet	$ 90,327,000	$ 1,968,000	$ 121,812,000	1.20%

Over the life of the equipment, the net increase in rates would be ~0.53%, which would be reimbursed by rate payers. As mentioned, Lake Michigan arsenic levels already exceed 0.20 ug/L, so the installation of the treatment system would not be expected to result in a measurable impact on the levels of arsenic in Lake Michigan. It would create widespread, adverse financial impact on EDG's customers with little environmental benefit.

VI. PROPOSED VARIANCE LIMIT

The proposed arsenic variance limit is 5.1 ug/L at Outfall 004 and 2.5 ug/L at Outfall 009. The variance limit at Outfall 004 is set using a 1-day P99. Arsenic data for Outfall 009 does not exist so the department set the interim arsenic limit using a mass balance approach as described below:
Outfall 009 Flow: **201 MGD** which is based on the peak daily flow at Outfall 009 from January 2013 to March 2019.
Outfall 009 Arsenic Concentration: **2.2 ug/L** which is based on the highest measured arsenic value at both Unit 4 and 5 surface water intakes from 2012-present.
Outfall 004 Flow: **19.6 MGD** which is based on the peak daily flow at Outfall 004 from January 2013 to March 2019.
Outfall 004 Arsenic Concentration: **5.1 ug/L** which is the 1-day P99 for Outfall 004.

(Outfall 009 Flow)(Outfall 009 Arsenic) + (Outfall 004 Flow)(Outfall 004 Arsenic) = (Total Flow)(Arsenic Limit)
(201 MGD)(2.2 ug/L) + (19.6 MGD)(5.1 ug/L) = (220.6 MGD)(Arsenic Limit)
This results in a limit of **2.5 ug/L** at Outfall 009.

Attachment 8: Water Flow Schematic(s)

Polisher Drains

Unit 5 Condensate Polisher Sump

Unit 5 Demin Sump

Demin Regen/ Drains

KEY
Existing
New
Normally Closed (NC)
Normally Open (NO)

AQCS Strainer Backwash

Bottom Ash Unloading Sump

U5 Ash Yard Sump (Precipitation)

Boiler Area Equipment and Floor Drains

Unit 5 Boiler Room Sump

Blow-off Sump Overflow

Blow-off Sump

North Low Vol Waste Tank (100,000 gal)

South Low Vol Waste Tank (100,000 gal)

Pump Recirc

Pump Recirc

SO4

pH

pH

SO4

2 x 100% AQCS Supply Pumps (1 new, 1 existing)

Base Operating Mode:

1. Plant LVWW is acceptable for Scrubber use. Scrubber demand is approximately equal to LVWW capacity. 100% of LVWW will be sent to Scrubber.

2. Blow-off Tank Overflow is sent directly to Condenser Discharge/Service Water Return Outfall.

2 x 100% Blow-off Discharge Sump Pumps

Avg = 356 gpm
Max = 398 gpm

Grab Sample

City Water Supply

Avg = 238 gpm
Max = 327 gpm

Cooling Tank

Scrubber

Normal Flow = 0 gpm
Intermittent Avg Flow = 200 gpm
Intermittent Max Flow = 600 gpm

1st Purge Option

FM 1

Composite Sampler

Avg = 356 gpm
Max = 398 gpm

Service Water Return

52 gpm

Boiler Blowdown

Blow-off Tank

Grab Sample

Avg = 304 gpm
Max = 346 gpm

TCV

Service Water Supply

Cyclone Separator

AQCS Strainer 5-1

AQCS Strainer 5-2

FM 2

Grab Sample (future composite sampler)

CONCEPTUAL DESIGN ONLY

ISSUE	DATE	DESCRIPTION
Final	12/19/19	Process Flow Schematic – Final Issue

PROJECT MANAGER	Ryan Essex
ENGINEER	Josh Prusakiewicz
PROJECT NUMBER	

Unit 5 Edgewater Generating Station

Base Operation – Normal Load

Low Volume Wastewater Process Flow Diagram

SHEET 1 of 5

Polisher Drains

Unit 5 Condensate Polisher Sump

Unit 5 Demin Sump

Demin Regen/ Drains

KEY
Existing
New
Normally Closed (NC)
Normally Open (NO)

AQCS Strainer Backwash

Bottom Ash Unloading Sump

U5 Ash Yard Sump (Precipitation)

Boiler Area Equipment and Floor Drains

Unit 5 Boiler Room Sump

Blow-off Sump Overflow

Blow-off Sump

North Low Vol Waste Tank (100,000 gal)

South Low Vol Waste Tank (100,000 gal)

Pump Recirc

Pump Recirc

SO4

pH

pH

SO4

2 x 100% AQCS Supply Pumps (1 new, 1 existing)

Base Operating Mode (Low Load):

1. Plant LVWW is acceptable for Scrubber use. Scrubber demand is less than LVWW capacity. LVWW flow is split between Scrubber and Outfall

2. Blow-off Tank Overflow is sent directly to Condenser Discharge/Service Water Return Outfall.

2 x 100% Blow-off Discharge Sump Pumps

Avg = 356 gpm
Max = 398 gpm

Grab Sample

City Water Supply

Avg = 238 gpm
Max = 327 gpm

Cooling Tank

Scrubber

Normal Flow = 0 gpm
Intermittent Avg Flow = 200 gpm
Intermittent Max Flow = 600 gpm

1st Purge Option

52 gpm
Boiler Blowdown

Blow-off Tank

Grab Sample

Avg = 304 gpm
Max = 346 gpm

TCV

Service Water Supply

Cyclone Separator

AQCS Strainer 5-1

AQCS Strainer 5-2

FM 1

Composite Sampler

Avg = 356 gpm
Max = 398 gpm

Service Water Return

FM 2

Grab Sample (future composite sampler)

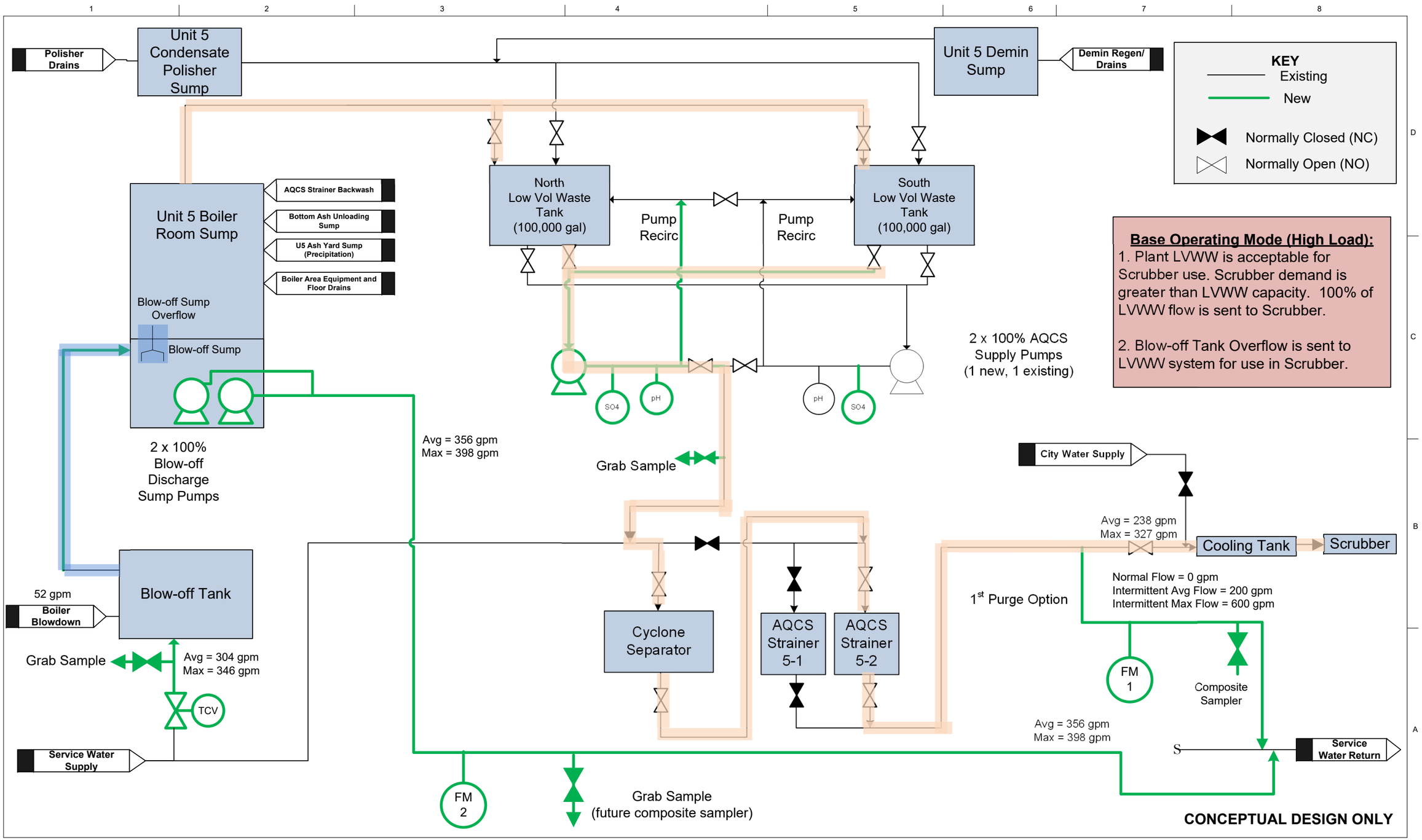
CONCEPTUAL DESIGN ONLY

ISSUE	DATE	DESCRIPTION
Final	12/19/19	Process Flow Schematic – Final Issue

PROJECT MANAGER	Ryan Essex
ENGINEER	Josh Prusakiewicz
PROJECT NUMBER	

Unit 5 Edgewater Generating Station

Base Operation – Low Load
Low Volume Wastewater
Process Flow Diagram



ISSUE	DATE	DESCRIPTION
Final	12/19/19	Process Flow Schematic – Final Issue

PROJECT MANAGER	Ryan Essex
ENGINEER	Josh Prusakiewicz
PROJECT NUMBER	

Unit 5 Edgewater Generating Station

Base Operation – High Load
Low Volume Wastewater
Process Flow Diagram

SHEET 3 of 5

Polisher Drains

Unit 5 Condensate Polisher Sump

Unit 5 Demin Sump

Demin Regen/ Drains

KEY
- Existing
- New
- Normally Closed (NC)
- Normally Open (NO)

AQCS Strainer Backwash

Bottom Ash Unloading Sump

U5 Ash Yard Sump (Precipitation)

Boiler Area Equipment and Floor Drains

Unit 5 Boiler Room Sump

Blow-off Sump Overflow

Blow-off Sump

2 x 100% Blow-off Discharge Sump Pumps

Avg = 356 gpm
Max = 398 gpm

North Low Vol Waste Tank (100,000 gal)

South Low Vol Waste Tank (100,000 gal)

Pump Recirc

Pump Recirc

SO4

pH

pH

SO4

2 x 100% AQCS Supply Pumps (1 new, 1 existing)

Condensate Polisher Regeneration Mode:

1. Condensate polisher regeneration to have pH neutralization and sulfate dilution in process.

2. Blow-off Tank Overflow is sent directly to Condenser Discharge/Service Water Return Outfall.

Grab Sample

City Water Supply

Avg = 238 gpm
Max = 327 gpm

Cooling Tank

Scrubber

Normal Flow = 0 gpm
Intermittent Avg Flow = 200 gpm
Intermittent Max Flow = 600 gpm

1st Purge Option

52 gpm
Boiler Blowdown

Blow-off Tank

Grab Sample

Avg = 304 gpm
Max = 346 gpm

TCV

Service Water Supply

Cyclone Separator

AQCS Strainer 5-1

AQCS Strainer 5-2

FM 1

Composite Sampler

Avg = 356 gpm
Max = 398 gpm

Service Water Return

FM 2

Grab Sample (future composite sampler)

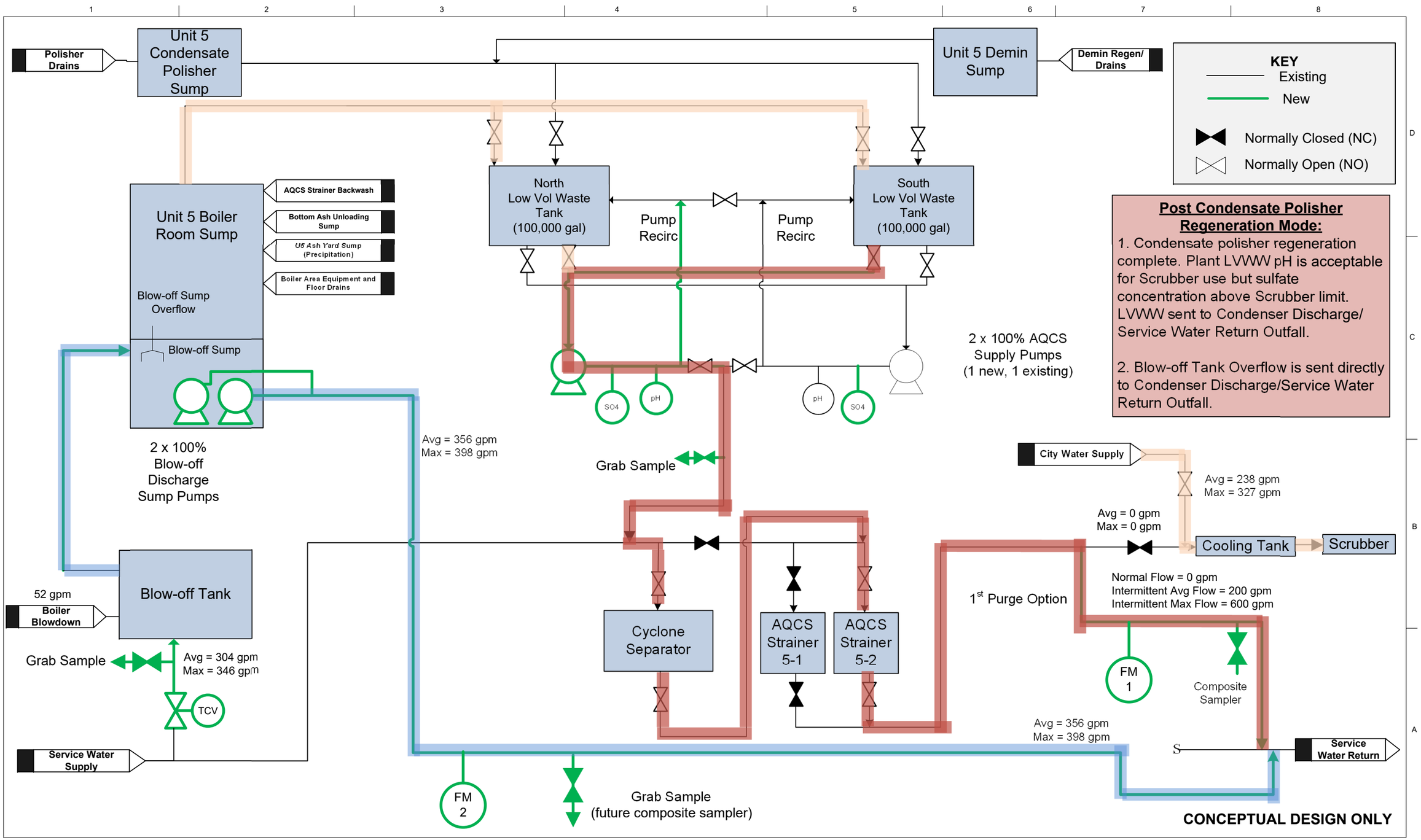
CONCEPTUAL DESIGN ONLY

ISSUE	DATE	DESCRIPTION
Final	12/19/19	Process Flow Schematic – Final Issue

PROJECT MANAGER	Ryan Essex
ENGINEER	Josh Prusakiewicz
PROJECT NUMBER	

Unit 5 Edgewater Generating Station

Polisher Regeneration
Low Volume Wastewater
Process Flow Diagram



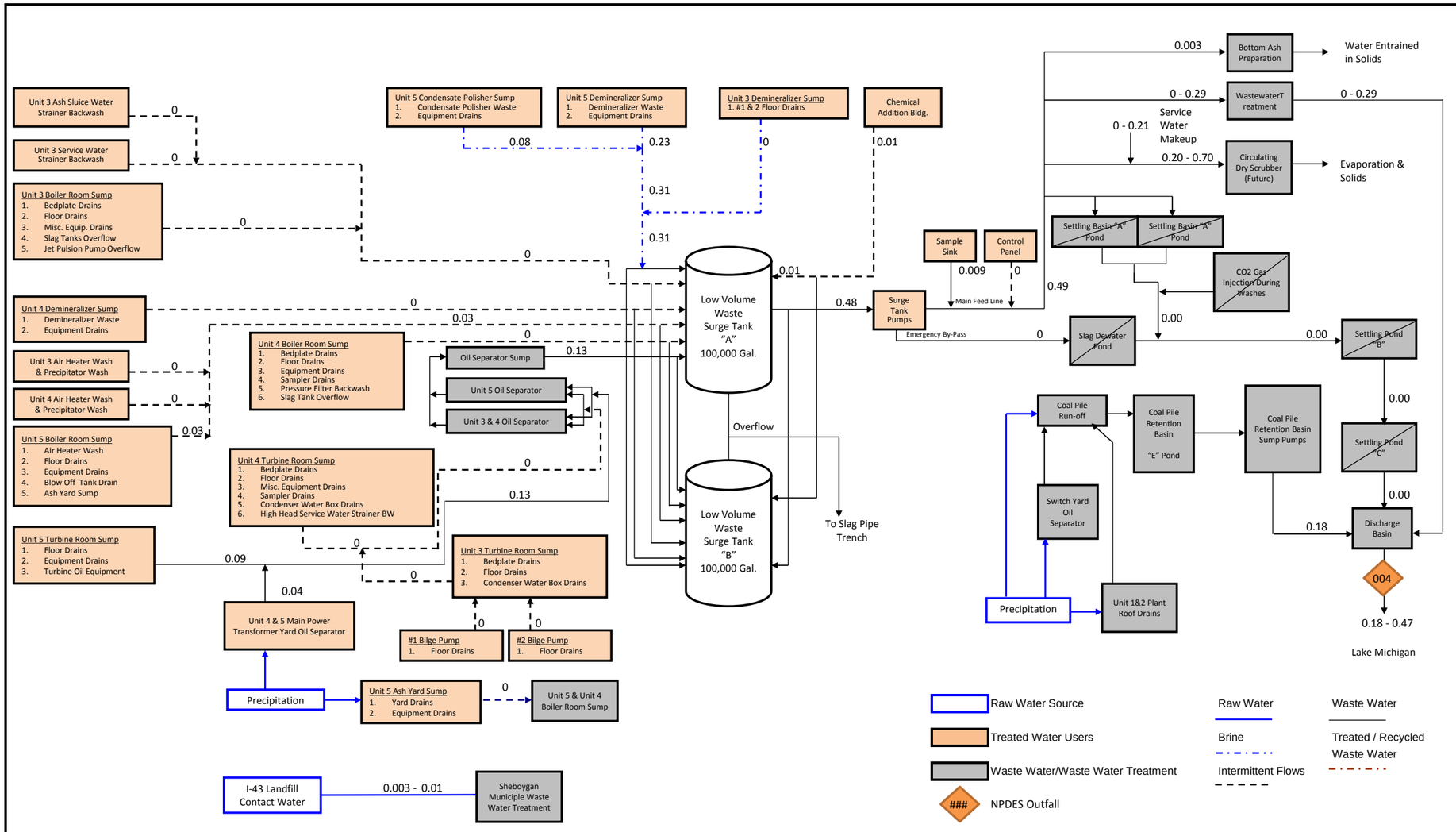
ISSUE	DATE	DESCRIPTION
Final	12/19/19	Process Flow Schematic – Final Issue

PROJECT MANAGER	Ryan Essex
ENGINEER	Josh Prusakiewicz
PROJECT NUMBER	

Unit 5 Edgewater Generating Station

Post Polisher Regeneration Low Volume Wastewater Process Flow Diagram

SHEET 5 of 5



Notes:

1. Assumes Unit 3 and Unit 4 have been retired.
2. Chemical Addition Building Sump flow assumed to be 10 gpm.
3. Ash Trench Sump Flow primarily hydrobin area runoff.
4. Unit 4 Demineralizer Sump Demin Waste and RO Waste assumed to be negligible due to Unit 4 retirement.
5. Unit 5 Condensate Polisher Sump Condensate Waste from sump pump 5-1 & 5-2 flow data dated Sept 22, 2015 to Sep 23, 2015.
6. Unit 5 Demineralizer Sump Demin Waste RO Reject assumed to be 82 gpm. Unit 5 Demineralizer Waste from sump pump 5-1 flow data dated Oct 12, 2015
7. Unit 5 Boiler Room Sump Bottom Ash Seal Water Flow is assumed to be 0 gpm due to the seal trough being decommissioned for dry ash handling, floor drains assumed to be 8 gpm and Equipment Drains assumed to be 40 gpm.
8. Unit 5 Turbine Room Sump, equipment drains flow from sump pump 5-2 flow data dated Sep 17, 2015, floor drains assumed to be 12 gpm and turbine oil equipment assumed to be 12 gpm.
9. Unit 5 Ash Yard Sump Drains assumed to be directed away from the ash handling system. Equipment drains flow assumed to be 0 gpm due to equipment demolition.
10. Circulating Dry Scrubber water usage rates provided by Andritz Environmental Document 311225-0M-60001, Rev 1
11. Bottom ash preparation water based on an ash make rate of 3 dry tons per hour and a 15wt% water content.
12. I-43 Landfill contact water flow based on 1 - 5 million gallons per year.

Drawing Release Record

Rev	Date	Prepared	Reviewed	Approved	Purpose
A0	18-Jan-16	K. Cheong	M. Heermann	D. Flagg	Initial Issue
A1	12-Feb-16	K. Cheong	M. Heermann	D. Flagg	Client Comments
A2	23-Feb-16	K. Cheong	M. Heermann	D. Flagg	Client Comments

Project No: 13391-002

Owner: ALLIANT ENERGY

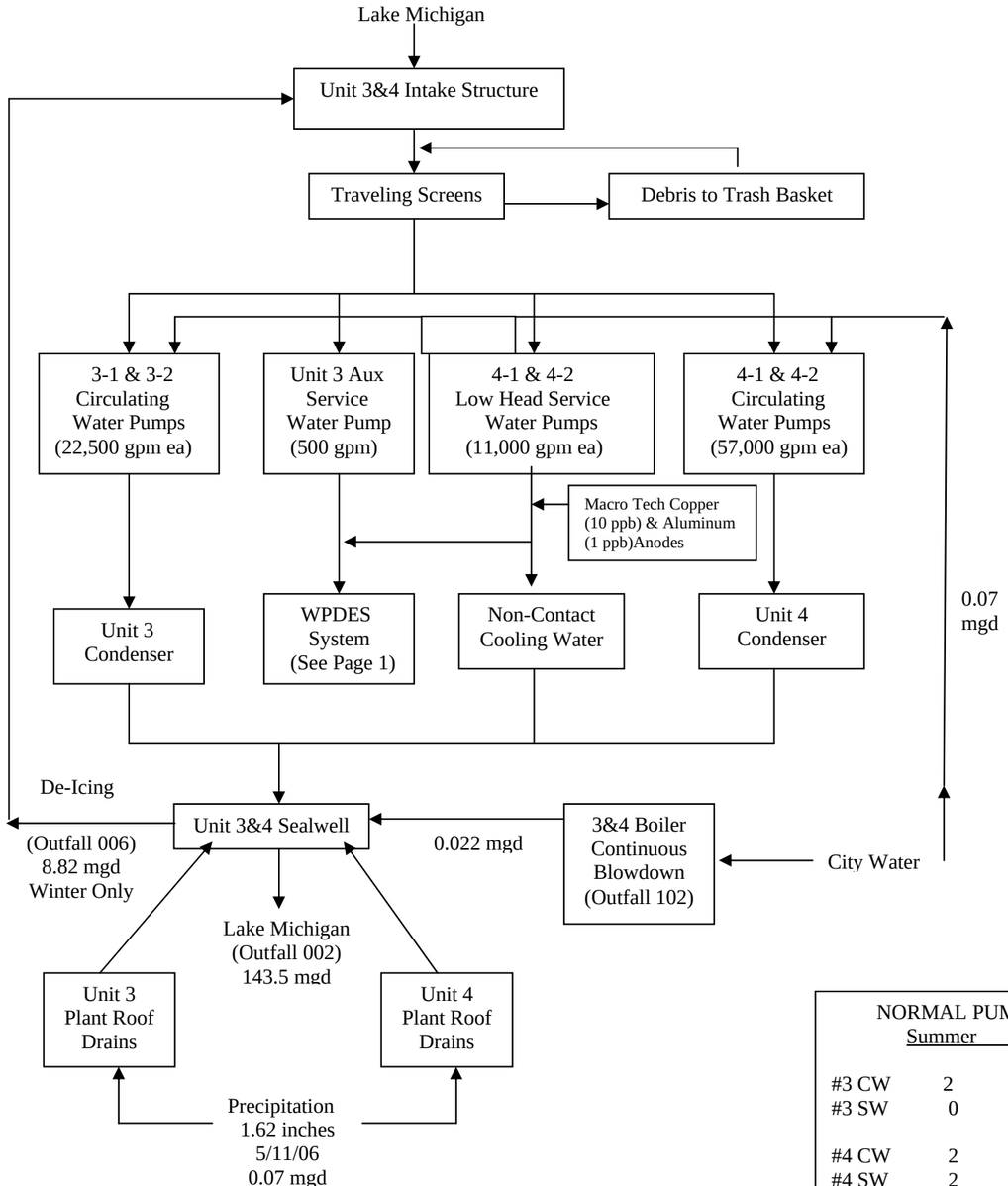
Engineer: Sargent & Lundy LLC

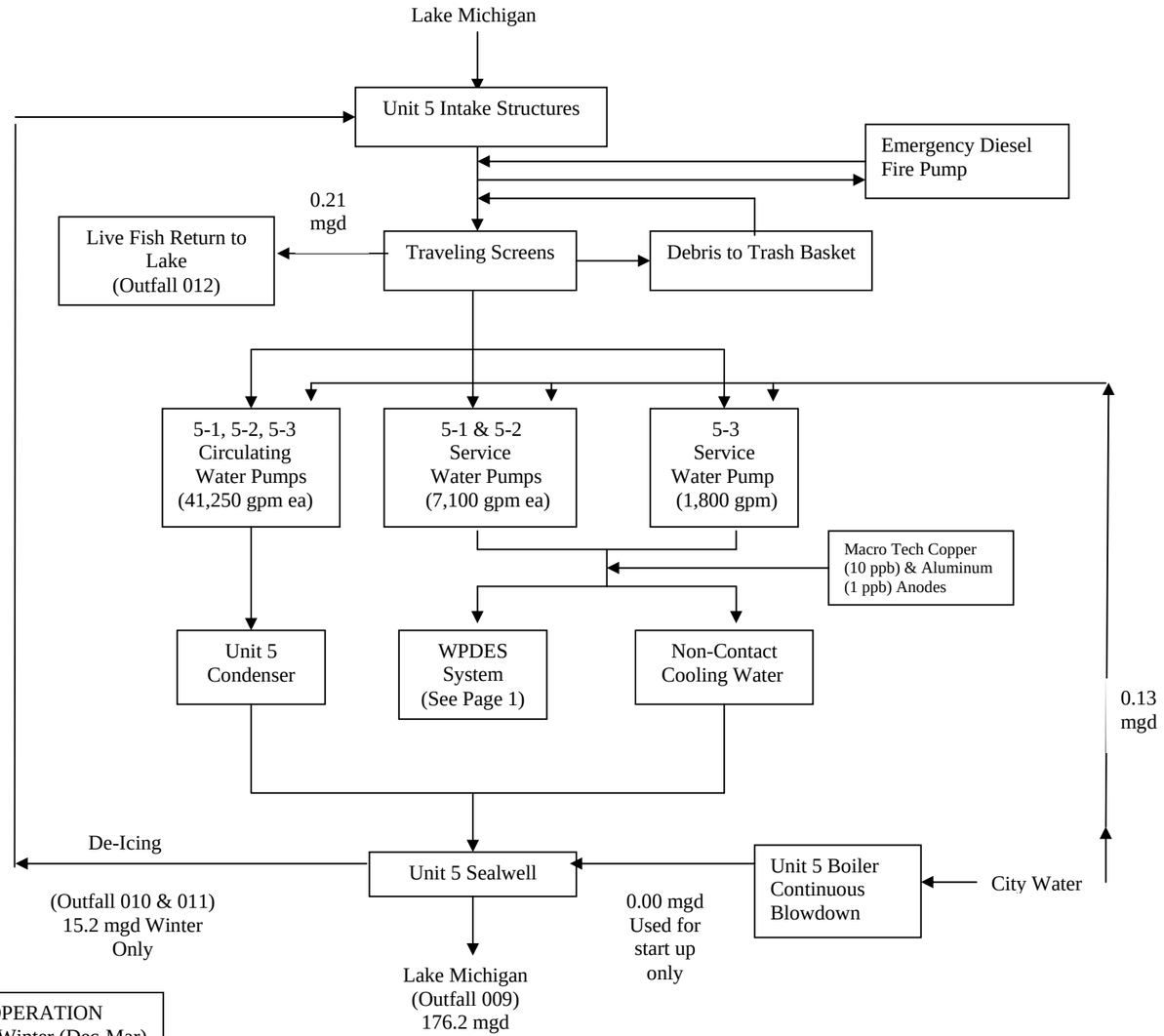
Alliant - Edgewater Generating Station

Water and Ash Planning Project
Preliminary Water Balance
Dry Ash Handling

MSK-EDG-WB-002

EDGEWATER
Circulating Water Systems

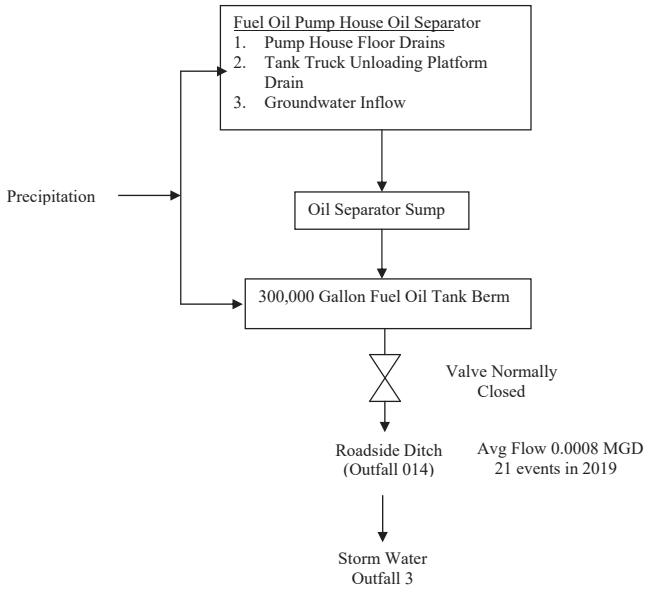




NORMAL PUMPS OPERATION

	Summer	Winter (Dec-Mar)
#3 CW	2	1
#3 SW	0	0
#4 CW	2	1
#4 SW	2	1
#5 CW	3	3
#5 SW	1	1
#5 SW	1	0

EDGEWATER
Fuel Oil Pump House and Tank System



Attachment 9: Maps(s)

Existing WPDES Outfalls

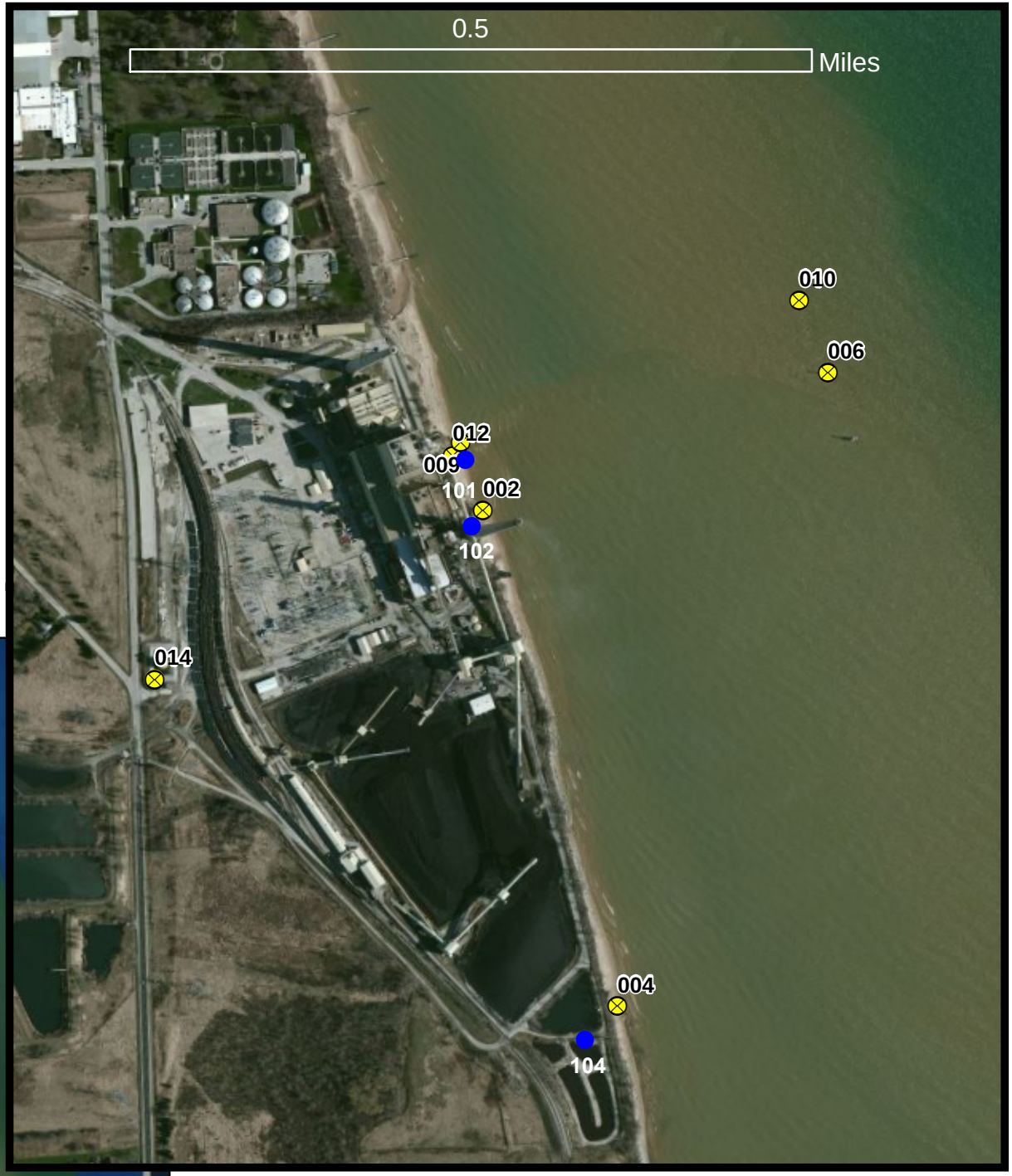
Legend

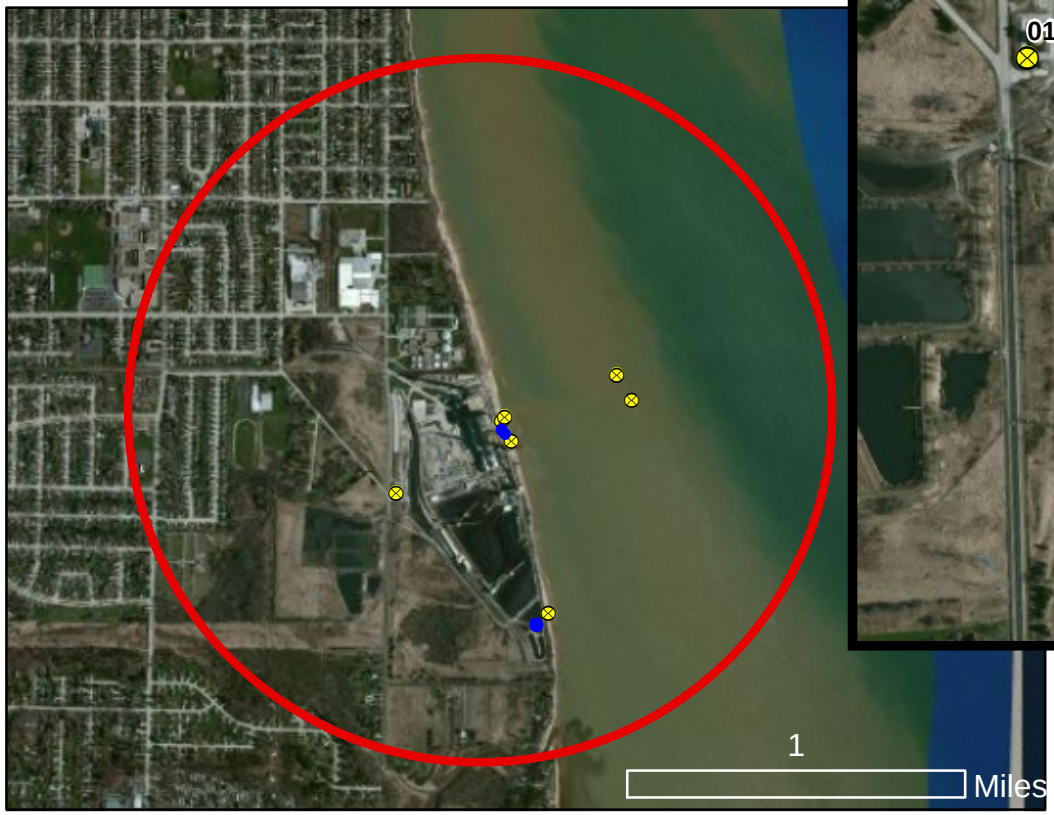
Outfalls

- 002 Condenser Cooling Unit 4
- 004 Ash Pond Discharge
- 006 Intake De-Icing
- 009 Condenser Cooling Unit 5
- 010 Intake De-Icing
- 012 Fish Return
- 014 Stormwater from Fuel Oil Berm

Sample Points

- 101 Mercury Field Blank
- 102 Unit 4 Boiler Blowdown
- 104 Pumphouse to Pond F





N

Alliant Energy

Attachment 10: Public Notice

STATE OF WISCONSIN DEPARTMENT OF NATURAL RESOURCES

PUBLIC NOTICE OF INFORMATIONAL HEARING AND INTENT TO REISSUE A WISCONSIN POLLUTANT DISCHARGE ELIMINATION SYSTEM (WPDES) PERMIT No. WI-0001589-09-0

Permittee: Wisconsin Power and Light Edgewater - Generating Station, 3739 Lakeshore Drive, Sheboygan, WI, 53081-7233

Facility Where Discharge Occurs: Wisconsin Power and Light Edgewater - Generating Station, 3739 Lakeshore Drive

Receiving Water and Location: Lake Michigan in Sheboygan County

Brief Facility Description and Summary of Proposed Changes: Wisconsin Power and Light – Edgewater Generation Station (EDG), operates a steam electric generating plant located on the western shore of Lake Michigan just south of Sheboygan, Wisconsin. The plant has one generating unit (Unit 5) which uses subbituminous coal as the fuel source and has a nameplate capacity of 380 megawatts (MW) of electricity. The plant discharges wastewater to Lake Michigan at multiple locations, designated as Outfalls 002, 004, 009, 010, 012, and 014. The draft permit reflects numerous changes at the facility to include the retirement of two generating units, converting the remaining generating unit (Unit 5) to a dry ash handling system, and reusing low volume wastewaters within its air quality control system to reduce wastewater pollutants discharged to Lake Michigan.

Permit Drafter's Name, Address, Phone and Email: Ian Hansen, DNR, 101 S. Webster St. PO Box 7921, Madison, WI, 53707-7921, (608) 266-9239, Ian.Hansen@wisconsin.gov

Basin Engineer's Name, Address, Phone and Email: Curtis Nickels, 1155 Pilgrim Road, Plymouth, WI 53073, (920) 893-8530, Curtis.Nickels@wisconsin.gov

The Department has tentatively decided that the above specified WPDES permit should be reissued.

Proposed Arsenic Variance: The Department has determined that a water quality based effluent limitation (WQBEL) of 0.2 ug/L for arsenic is needed to protect human health in the above-named receiving water. The permittee has submitted an application for a variance. The Department concludes that the permittee is eligible for a variance based on the information submitted and information on file. The Department and the permittee have mutually agreed upon an initial limit of 2.5 ug/L, expressed as a daily maximum, continued influent and effluent monitoring, and permit language requiring continuing efforts to further reduce arsenic discharges. The Department proposes to grant the variance to the water quality standard used to derive the WQBEL. The designated use of the receiving water will not change as a result of the variance. The arsenic variance must be approved by USEPA prior to its inclusion in the final reissued permit.

Hearing Date, Time, and Location: April 15, 2020, 12 p.m. – 1 p.m., University of Wisconsin Green Bay – Sheboygan Campus Theater, 1 University Drive, Sheboygan, WI 53081

Hearing Officer, Name, Address, City/State/Zip , and Phone: Jason Knutson, DNR, 101 S. Webster St. PO Box 7921, Madison, WI, 53707-7921, (608) 267-7894

The Department of Natural Resources, pursuant to Section 283.49, Wisconsin Statutes, has scheduled for the time and place listed above, a public hearing for the purpose of giving all interested persons an opportunity to make a statement with respect to the above announced permit action for this existing discharge.

A hearing officer will conduct the hearing in an orderly and speedy way and will use procedures specified in Subchapter II of ch. NR 203, Wis. Adm. Code, necessary to ensure broad public participation in the hearing.

The hearing officer will open the hearing and make a concise statement of the scope and purpose of the hearing and shall state what procedures will be used during the course of the hearing. The hearing officer shall explain the method of notification of the final decision to grant or deny the permit and the methods by which the decision may be reviewed in a public adjudicatory hearing.

The hearing officer may put limits on individual oral statements to ensure an opportunity for all persons present to make statements in a reasonable period of time and to prevent undue repetition. The hearing officer may also limit the number of representatives making oral statements on behalf of any person or group.

Informational and clarifying questions and oral statements shall be directed through the hearing officer. Cross-examination shall not be allowed.

Persons wishing to comment on or object to the proposed permit action are invited to do so by attending the public hearing or by submitting any comments or objections in writing to the Department of Natural Resources, at the above named permit drafter's address. All comments or suggestions received from members of the public no later than 7 days following the date of this public hearing will be used, along with other information on file and testimony presented at the hearing, in making a final determination. Where designated as a reviewable surface water discharge

permit, the U.S. Environmental Protection Agency is allowed up to 90 days to submit comments or objections regarding this permit determination.

Information on file for this permit action, including the draft permit, fact sheet and permit application, may be inspected and copied at either the above named permit drafter's office or the above named basin engineer's office, Monday through Friday (except holidays), between 9:00 a.m. and 3:30 p.m. Please call the permit drafter or basin engineer for directions to their office location, if necessary. Information on this permit action may also be obtained by calling the permit drafter at (608) 266-9239 or by writing to the Department. Reasonable costs (15 cents per page for copies and 7 cents per page for scanning) will be charged for information in the file other than the public notice, permit and fact sheet. Permit information is also available on the internet at: http://dnr.wi.gov/topic/wastewater/PublicNotices.html. Pursuant to the Americans with Disabilities Act, reasonable accommodation, including the provision of informational material in an alternative format, will be made to qualified individuals upon request.

NAME OF PUBLISHING NEWSPAPER: Sheboygan Press

ADDRESS OF PUBLISHING NEWSPAPER: Sheboygan Press; 632 Center Ave.; Sheboygan, WI 53081-4621

Date Notice Issued: March 13, 2020

Attachment 11: EPA Arsenic Variance Data Sheet

Facility Specific Arsenic Variance Data Sheet

Directions: Please complete this form electronically. Record information in the space provided. Select checkboxes by double clicking on them. Do not delete or alter any fields. For citations, include page number and section if applicable. Please ensure that all data requested are included and as complete as possible. Attach additional sheets if needed.

Section I: General Information

A. Name of Permittee: Wisconsin Power and Light Company (WPL) – Edgewater Generating Station (EDG)

B. Facility Name: Wisconsin Power and Light Company (WPL) – Edgewater Generating Station (EDG)

C. Submitted by: Wisconsin Department of Natural Resources

D. State: Wisconsin **Substance:** Arsenic **Date completed:** March 11, 2020

E. Permit #: WI-0001589-09-0 **WQSTS #:** (EPA USE ONLY)

F. Duration of Variance **Start Date:** July 1, 2020 **End Date:** June 30, 2025

G. Date of Variance Application: August 28, 2013 with updates on October 23, 2018

H. Is this permit a:
- ☒ **First time submittal for variance**
- ☐ **Renewal of a previous submittal for variance** *(Complete Section X)*

I. Description of proposed variance:

The department reissued EDG's WPDES Permit No. WI-0001589-08-0 on July 1, 2013 which included water quality based arsenic limits of 0.2 ug/L at Outfall 004. In accordance with s. NR 283.15(2)(am)1., Wis. Stats., the permittee applied for a variance within 60 days of permit reissuance with a WQBEL. Due to the variance application, the limit and associated compliance schedule did not become effective. The department modified EDG's WPDES permit on October 1, 2016. Modifications included a thermal AEL and other small changes, but the department did not make a final determination on the arsenic variance application. WPDES Permit No. WI-0001589-08-1 expired on June 30, 2018. The permittee submitted updated arsenic variance information to reflect some of the major changes occurring at the plant. This information is documented in a letter dated October 23, 2018. An arsenic pollutant minimization plan (PMP) was submitted on December 26, 2019.

The department proposes to approve the variance based the factor allowed under s. 283.15(4)(a)1.c., Wis. Stats., s. NR 200.20(2)(c), Wis. Adm. Code, and 40 CFR Part 132, Appendix F, Procedure 2.C.1.c. The factor (commonly referred to as a "Factor 3") states that human caused conditions or sources of pollution prevent the attainment of the standard and cannot be remedied or would cause more environmental damage to correct than to leave in place. Arsenic in Lake Michigan is both naturally occurring as well as human caused. Presently, the ability for available technologies to reliably treat arsenic down to 0.2 ug/L is relativity uncertain, yet very expensive in terms of both capital and O&M costs. Background levels in Lake Michigan, which is the source water for cooling and service water at the facility, exceeds the arsenic water quality standard of 0.2 ug/L. The installation and operation of a treatment system would not be expected to result in a measurable impact on the levels of arsenic in Lake Michigan. It would create adverse financial impacts on EDG's customers with little environmental benefit. The permittee has also submitted economic impact evaluation information.

Section NR 106.06(6), Wis. Adm. Code provides procedures for setting limits based on elevated background concentrations in the receiving water. Generally, an effluent limit may be set equal to the representative background concentration of the receiving water however there are two technicalities that prevent the permittee from obtaining an effluent limit equal to background concentrations in Lake Michigan.

1. Because there may periodically be a discharge of LVWW through Outfall 009, there may be a small addition of arsenic mass to the discharge. Section NR 106.06(6)(b)2., Wis. Adm. Code states that the permittee may not contribute any additional arsenic mass to its discharge to be eligible for an effluent limit equal to background arsenic concentrations in the receiving water.
2. Because the discharge is in the Great Lakes System. Section NR 106.06(6)(c)1., Wis. Adm. Code states that limits shall be set to the most stringent applicable water quality criterion which is 0.2 mg/L of arsenic for Lake Michigan.

The proposed arsenic variance limit is 5.1 ug/L at Outfall 004 and 2.5 ug/L at Outfall 009. The variance limit at Outfall 004 is set using a 1-day P99. Arsenic data for Outfall 009 does not exist so the department set the interim arsenic limit using a mass balance approach as described below:
Outfall 009 Flow: **201 MGD** which is based on the peak daily flow at Outfall 009 from January 2013 to March 2019.
Outfall 009 Arsenic Concentration: **2.2 ug/L** which is based on the highest measured arsenic value at both Unit 4 and 5 surface water intakes from 2012-present.
Outfall 004 Flow: **19.6 MGD** which is based on the peak daily flow at Outfall 004 from January 2013 to March 2019.
Outfall 004 Arsenic Concentration: **5.1 ug/L** which is the 1-day P99 for Outfall 004.
(Outfall 009 Flow)(Outfall 009 Arsenic) + (Outfall 004 Flow)(Outfall 004 Arsenic) = (Total Flow)(Arsenic Limit)
(201 MGD)(2.2 ug/L) + (19.6 MGD)(5.1 ug/L) = (220.6 MGD)(Arsenic Limit)
This results in a limit of **2.5 ug/L** at Outfall 009.
The permittee is requesting a variance from the Human Cancer Criterion (HCC) for arsenic in a public water supply and its use to derive the Water Quality Based Effluent Limitations at both Outfalls 004 and 009. The Wisconsin Department of Natural Resources (hereafter Department) has determined that limits for arsenic would be applicable at WPDES permit Outfall 004 and 009. The HCC, as specified in Table 9 of s. NR 105.09(3), Wis. Adm. Code, is 0.2 µg/L.

J. List of all who assisted in the compilation of data for this form

Name	Email	Phone	Contribution
Ian Hansen	Ian.Hansen@wisconsin.gov	608-266-9239	All sections except as noted
Curt Nickels	Curtis.Nickels@wisconsin.gov	920-893-8530	
Rachel Fritz	Rachel.Fritz@wisconsin.gov	608-267-7657	Parts II D-H and J

Section II: Criteria and Variance Information

A. Water Quality Standard from which variance is sought: 0.2 µg/L human cancer criterion in water used for public water supply.

B. List other criteria likely to be affected by variance: None.

C. Source of Substance: Remaining sources of arsenic at the facility include:

- Coal
  - Trace concentrations of arsenic are present in coal and depends on the type of coal being mined. Subbituminous coal is known to typically contain the lowest concentrations and EDG burns only subbituminous coal. Arsenic concentrations in the facility's coal have average 734 ug/kg since 2000.
  - Coal pile runoff which is discharged through Outfall 004 contains arsenic which is reflective of the arsenic concentration of the coal.

- Lake Michigan Intake Water
  - Water is withdrawn from Lake Michigan primarily for condenser cooling. Arsenic concentrations in Lake Michigan sampled at the intake averaged 1.05 ug/L. The water quality standard (WQS) for Lake Michigan is 0.2 ug/L. The maximum contaminant level (MCL) for public drinking water supplies is 10 ug/L.

- Steam-Grade Water Production
  - Water received from the City of Sheboygan (which is sourced from Lake Michigan) is processed through a RO and ion exchange demineralizer system to produce steam grade water. Reject water in sent to the WPDES system, which is intended to be reused in the Unit 5 AQCS but sometimes discharged through Outfall 009. Drinking water standards require arsenic be less than 10 ug/L, so it's highly probable that arsenic is present in the reject waste stream.
  - Boiler blowdown is also considered steam grade water. This water is separated from the WPDES system and discharged through Outfall 004, with contingencies to be used in the Unit 5 AQCS if needed.

D. Ambient Substance Concentration:

1-day P99	1.7 ug/L
4-day P99	1.3 ug/L
30-day P99	1.0 ug/L
Mean	0.9 ug/L

☒ **Measured** ☐ **Estimated** ☐ **Default** ☐ **Unknown**

E. If measured or estimated, what was the basis? Include citation. The permittee submitted monitoring data at its Unit 5 surface water intake (SP 709) consisting of 33 samples from 2013 to 2018.

F. Average effluent discharge rate:
Outfall 004: 7.31 MGD
Outfall 009: 162 MGD

Maximum effluent discharge rate:
Outfall 004: 8.85 MGD
Outfall 009: 183 MGD

G. Effluent Substance Concentration: ☒ **Measured** ☒ **Estimated** ☐ **Default** ☐ **Unknown**

Outfall 004	
1-day P99	5.1 ug/L
4-day P99	3.4 ug/L
30-day P99	2.5 ug/L
Mean	2.1 ug/L

Outfall 009
Arsenic data for Outfall 009 does not exist. The department is using a mass balance approach to set an interim arsenic limit at Outfall 009. It's assumed the concentrations in the discharge will be highly reflective of Lake Michigan background concentrations.

H. If measured or estimated, what was the basis? Include Citation.
The permittee submitted monitoring data at Outfall 004 consisting of 18 samples from 2017 to 2019. Note that ~5 of these samples were conducted prior to Unit 4 retirement and conversion of Unit 5 to dry bottom ash. Averages in Part G may be slightly different than current operations.

I. Type of HAC:
☐ **Type 1: HAC reflects waterbody/receiving water conditions**
☐ **Type 2: HAC reflects achievable effluent conditions**
☒ **Type 3: HAC reflects current effluent conditions**

J. Statement of HAC: The Department has determined the highest attainable condition (HAC) of the receiving water is achieved through the application of the variance limit in the permit, combined with a permit requirement that the permittee implement its arsenic Pollutant Minimization Program (PMP). Thus, the HAC at commencement of this variance is 5.1 ug/L for Outfall 004 and 2.5 ug/L for Outfall 009, which reflects the greatest arsenic reduction achievable with the current treatment processes, in conjunction with the implementation of the permittee's arsenic PMP. The current effluent condition is reflective of on-site optimization measure that have already occurred. This HAC determination is based on the economic feasibility of available compliance options for the permittee at this time (see Economic Section below). The permittee may seek to renew this variance in the subsequent reissuance of this permit; the Department will reevaluate the HAC in its review of such a request. A subsequent HAC cannot be defined as less stringent than this HAC.

K. Variance Limit: 5.1 ug/L for Outfall 004 and 2.5 ug/L for Outfall 009

L. Level Currently Achievable (LCA): 5.1 ug/L for Outfall 004 and 2.5 ug/L for Outfall 009

M. What data were used to calculate the LCA, and how was the LCA derived? The Department proposes a LCA set equal to the 1-day P99 of 5.1 µg/L, expressed as a daily maximum for Outfall 004. The permittee submitted the monitoring data consisting of 18 samples from 2017 to 2019. Note that ~5 of these samples were conducted prior to Unit 4 retirement and conversion of Unit 5 to dry bottom ash.

Arsenic data for Outfall 009 does not exist so the department set the interim arsenic limit using a mass balance approach as described below:
Outfall 009 Flow: **201 MGD** which is based on the peak daily flow at Outfall 009 from January 2013 to March 2019.
Outfall 009 Arsenic Concentration: **2.2 ug/L** which is based on the highest measured arsenic value at both Unit 4 and 5 surface water intakes from 2012-present.

Outfall 004 Flow: **19.6 MGD** which is based on the peak daily flow at Outfall 004 from January 2013 to March 2019.
Outfall 004 Arsenic Concentration: **5.1 ug/L** which is the 1-day P99 for Outfall 004.
(Outfall 009 Flow)(Outfall 009 Arsenic) + (Outfall 004 Flow)(Outfall 004 Arsenic) = (Total Flow)(Arsenic Limit)
(201 MGD)(2.2 ug/L) + (19.6 MGD)(5.1 ug/L) = (220.6 MGD)(Arsenic Limit)
This results in a limit of **2.5 ug/L** at Outfall 009.

N. Explain the basis used to determine the variance limit (which must be ≤ LCA). Include citation.
Wisconsin statutes specify that the initial limit for a variance must be no less stringent than the effluent limitation achieved under the permit before reissuance (s. 283.15(5)(c)1., Wis. Stats.). The current permit has no limits. The Department proposes a daily maximum limit because monitoring on a monthly basis will allow adequate data for the variance. The variance limit is set at the LCA which is the 1 Day P99 for Outfall 004. The variance limit for Outfall 009 is set using a mass balance approach. The limit is established in accordance with s. 283.15 (5), Wis. Stats. and ch. NR 106 Subchapter II, Wis. Adm. Code.

O. Select all factors applicable as the basis for the variance provided under 40 CFR 131.10(g). Summarize justification below: ☐ 1 ☐ 2 ☒ 3 ☐ 4 ☐ 5 ☐ 6
It has been determined that human caused conditions or sources of pollution prevent the attainment of the standard and the Department considers treating to produce effluent at concentrations to meet the limit to be technically and economically infeasible. See the attached analysis of arsenic in Lake Michigan and the discussion in Section VI. C. and Economics Section VIII below.

Section III: Location Information

A. Counties in which water quality is potentially impacted: Sheboygan

B. Receiving waterbody at discharge point: Lake Michigan

C. Flows into which stream/river? Lake Michigan **How many miles downstream?** N/A

D. Coordinates of discharge point (UTM or Lat/Long): Outfall 004: 43° 42′ 36.84″ N
87° 42′ 13.08″ W
Outfall 009: 43° 42′ 58.56″ N
87° 42′ 19.56″ W

E. What is the distance from the point of discharge to the point downstream where the concentration of the substance falls to less than or equal to the chronic criterion of the substance for aquatic life protection?
Zero. The concentration at the point of discharge is already less than the chronic toxicity criterion of 148 ug/L for aquatic life protection.

F. Provide the equation used to calculate that distance:
Not applicable.

G. What are the designated uses associated with the direct receiving waterbody, and the designated uses for any downstream waterbodies until the water quality standard is met?
Section NR 104.25, Wis. Adm. Code Wisconsin−Michigan−Illinois−Indiana waters. Lake Michigan is used for recreation, commercial and recreational fishing, shipping, public water supply, waste assimilation, and industrial and cooling water. All Lake Michigan waters shall meet the standards for public water supplies and the standards for recreational use and fish and aquatic life, in addition to the thermal criteria contained in s. NR 102.04, Wis. Adm. Code.

H. Identify all other variance permittees for the same substance which discharge to the same stream, river, or waterbody in a location where the effects of the combined variances would have an additive effect on the waterbody:

Permit Number	Facility Name	Facility Location	Variance Limit [mg/L]
0030848-08	Village of Cleveland	Southeast Manitowoc County	0.0045 mg/L daily max
0000914-08	Oak Creek Power Plant and Elm Road Generating Station	Milwaukee County	0.0012 mg/L daily max

I. Please attach a map, photgraphs, or a simple schematic showing the location of the discharge point as well as all variances for the substance currently draining to this waterbody on a separate sheet

J. Is the receiving waterbody on the CWA 303(d) list? If yes, please list the impairments below. ☒ Yes ☐ No ☐ Unknown

River Mile	Pollutant	Impairment
Mercury	Shorelines in Door, Kenosha, Kewaunee, Manitowoc, Milwaukee, Ozaukee, Racine, Sheboygan	Contaminated Fish Tissue
PCBs	Shorelines in Door, Kenosha, Kewaunee, Manitowoc, Milwaukee, Ozaukee, Racine, Sheboygan	Contaminated Fish Tissue
E. Coli	Beaches in Kenosha, Kewaunee, Manitowoc, Milwaukee, Racine	Recreational Restrictions - Pathogens

Section IV: Pretreatment (complete this section only for POTWs with DNR-Approved Pretreatment Programs. See w:\Variances\Templates and Guidance\Pretreatment Programs.docx)

A. Are there any industrial users contributing mercury to the POTW? If so, please list.
Not applicable.

B. Are all industrial users in compliance with local pretreatment limits for mercury? If not, please include a list of industrial users that are not complying with local limits and include any relevant correspondence between the POTW and the industry (NOVs, industrial SRM updates and timeframe, etc)
Not applicable.

C. When were local pretreatment limits for mercury last calculated?
Not applicable.

D. Please provide information on specific SRM activities that will be implemented during the permit term to reduce the industry's discharge of the variance pollutant to the POTW
Not applicable.

Section V: Public Notice

A. Has a public notice been given for this proposed variance? Yes, this variance and associated draft permit were public noticed on March 13, 2020 ☒ **Yes** ☐ **No**

B. If yes, was a public hearing held as well? ☒ **Yes** ☐ **No** ☐ **N/A**

C. What type of notice was given? ☒ **Notice of variance included in notice for permit** ☐ **Separate notice of variance**

D. Date of public notice: **March 13, 2020** **Date of hearing:** **April 15, 2020**

E. Were comments received from the public in regards to this notice or hearing? *(If yes, please attach on a separate sheet)* ☐ **Yes** ☐ **No**

Section VI: Human Health

A. Is the receiving water designated as a Public Water Supply? ☒ **Yes** ☐ **No**

B. Applicable criteria affected by variance: 0.2 µg/l human cancer criterion in water used for public water supply

C. Identify any expected impacts that the variance may have upon human health, and include any citations:
Arsenic loading to Lake Michigan is complex, involving over 45,000 square miles of drainage area from four states, regional impacts and even global effects. Several interrelated and continually changing systems affect the lake including streamflow, storm water runoff, precipitation, groundwater flow, point source discharges, legacy contamination, air deposition, soil mobilization, and sedimentation; these systems impact the arsenic concentrations in the water column. Arsenic is widely distributed in the Earth's crust as various minerals in bedrock and soils. Terrestrial contributions of arsenic are high relative to atmospheric contributions because arsenic is largely associated with particles. Particulate arsenic likely deposits to land or water surfaces relatively near its source. In water, arsenic is mobile over a wide range of redox conditions and its tendency to remain in a dissolved state at near neutral and alkaline pH values (Smedley & Kinniburgh, 2002).

Lake Michigan is fed by a vast network of rivers and streams. Baseline concentrations of arsenic in river waters vary according to the composition of the surface recharge, contribution from baseflow, and bedrock lithology. Relatively high concentrations of naturally occurring arsenic can occur in some areas as a result of inputs from geothermal sources or high-arsenic groundwaters. A large source of arsenic to river water is via groundwater.

Concentrations of arsenic in groundwater are generally considered to be due to dissolution of arsenic from arsenic-bearing rocks (Smedley & Kinniburgh, 2002).

In areas of southeast Wisconsin and in some glaciated areas of Northern Wisconsin, arsenic is bound to iron oxide minerals in the aquifer sediments. In these settings, groundwater at depth is susceptible to elevated arsenic due to a lack of oxygen in the groundwater system. A USGS study of groundwater wells from 1973 to 2001 found that the arsenic concentration in at least 25% of samples in southeast Wisconsin exceeded 1.0-3.0 µg/L (USGS, 2001). Pumping of groundwater for uses like public drinking water likely exacerbates the release of arsenic to groundwater as redox conditions change with the change in groundwater level.

In considering the loading from individual point sources to the overall loading of arsenic to Lake Michigan through natural and anthropogenic sources, it is unlikely that water quality standards would be met in Lake Michigan if the arsenic loading from this facility was suspended altogether. For this reason, this variance is not believed to have a siginificant impact on human health at this time. The results of individual permittees' actions in addition to pollution minimization efforts will also reduce any potential for negative impacts from the discharge. Additionally, the variance may help provide data and information that in general will help better define the scope and basis of the arsenic issues in Lake Michigan and actions that might be fruitful in reducing risk.

Citations:

Hutchinson, T. C. and Meema, K. M. (Editors). Lead, Mercury, Cadmium and Arsenic in the Environment. Scope 31. John Wiley & Sons, Chichester, 1987; 360 pp.

Neff, Brian P. and Nicholas, J.R. Uncertainty in the Great Lakes Water Balance. Scientific Investigations Report 2004-5100. United States Geological Service, 2005.

Smedley, P.L. and Kinniburgh, D.G. "A Review of the Source, Behavior, and Distribution of Arsenic in Natural Waters." Applied Geochemistry 17 (2002) 517 – 568.

USGS National Water Quality Assessment Program. http://water.usgs.gov/nawqa/trace/arsenic/. Ryker, 2001. Retrieved November 2014

Section VII: Aquatic Life and Environmental Impact

A. Aquatic life use designation of receiving water: Fish and aquatic life: s. NR 104.25, Wis. Adm. Code.

Cold water fishery: ss. NR 102.04(3)(a), Wis. Adm. Code, and Lake Michigan surface waters are capable of supporting a community of cold water fish and other aquatic life, or serving as a spawning area for cold water fish species

B. Applicable criteria affected by variance: Acute: 339.8 ug/L (As +3)
Chronic: 148 ug/L (As +3)

C. Identify any environmental impacts to aquatic life expected to occur with this variance, and include any citations:

Ambient arsenic concentrations in surface water resulting from the variance will be substantially less than levels that result in direct toxicity to aquatic organisms. EPA's current chronic aquatic life criterion for arsenic is 150 µg/L, which is approximately four orders of magnitude greater than the public health and welfare criteria (0.2 µg/L). Wisconsin's criteria are 340 µg/L and 148 µg/L for chronic and acute toxicity, respectively.

Although this variance will allow permitted dischargers additional time to identify and control sources of arsenic in their discharges, the pollutant minimization component of the variance should result in a net reduction in the amount of arsenic discharged to Wisconsin surface waters from permitted point sources further reducing risk to aquatic life and wildlife. In addition, the pollutant minimization programs for arsenic typically result in other pollution prevention efforts that have a beneficial indirect effect of reducing the use and production of products and processes that use or contribute arsenic to the environment. These efforts will also reduce any potential for negative impacts from the discharge. It is noted that a key source of arsenic pollution to

Wisconsin's surface waters is atmospheric deposition from sources within and outside the State. Arsenic is also present in natural sources through soil and rock erosion. Given the magnitude of the arsenic loading from these sources, it is unlikely that arsenic water quality criteria would be met if the arsenic loading from this facility was suspended altogether. For these reason, arsenic pollution from this discharge is believed to have a negligible impact on fish and aquatic life in the Lake.

D. List any Endangered or Threatened species known or likely to occur within the affected area, and include any citations:

County	Species	Status
Marinette, Oconto, Door, Sheboygan, Kenosha	Charadrius melodus, Piping Plover	LE = listed endangered
Brown, Kewaunee, Manitowoc, Ozaukee, Milwaukee, Racine	None	Not applicable
Kenosha	Sistrurus catenatus catenatus, Eastern Massasauga	C = candidate for future listing

Citation: U.S. Fish & Wildlife Service – Environmental Conservation Online System (http://www.fws.gov/endangered/) and National Heritage Index (http://dnr.wi.gov/topic/nhi/)

Section VIII: Economic Impact and Feasibility

A. Describe the permittee's current pollutant control technology in the treatment process:

As mentioned previously, Units 3 and 4 were retired which reduced sources of arsenic by eliminating low volume wastewaters sent to the pond system (Outfall 004) and reducing water withdrawal from Lake Michigan (SP 709). Unit 5 was converted to a dry bottom ash system in 2018. The permittee currently uses a pond system (Ponds A, B, C) for its LVWW but intends to abandon the ponds in 2020/2021 for compliance with the CCR rule. Once the ponds are abandoned the permittee will recycle some wastewater within the Unit 5 air quality control system, where it is believed that the water will be consumed in the process. Stormwater runoff from the coal pile is conveyed through a series of ditches and ultimately to a settling pond (Pond E) before discharge through Outfall 004. The permittee uses subbituminous coal which is known to typically contain the lowest concentrations of arsenic. Unit 5 fly ash is captured in electrostatic precipitators (ESPs) and stored in onsite silos for beneficial reused or placed in a landfill.

B. What modifications would be necessary to comply with the current limits? Include any citations.

The Burns & McDonnell report dated August 26, 2013 analyzed technologies that could treat 5 MGD of process wastewater at 2.5 ug/L of arsenic. The treatment processes evaluated would be required to provide greater than 90% removal of arsenic to meet the 0.2 ug/L effluent limit. Technologies evaluated included coagulation/filtration, lime softening, adsorptive media (Blue PRO®), ion exchange, and ZENON ABMET®. The report indicated that technologies may not be capable of consistently treating to 0.2 ug/L as most of the technology is designed to treat to the drinking water standard of 10 ug/L.

C. How long would it take to implement these changes?

Implementation timelines were not evaluated because none of the technologies were considered feasible alternatives. Projects of this magnitude require review and approval by the Wisconsin Public Service Commission, so it's estimated between 3-5 years.

D. Estimate the capital cost ***(Citation)*****:**

See Burns & McDonnell report dated August 26, 2013 for detailed analysis.

Technology	Capital Cost
Coagulation/Filtration	$14,363,000
Lime Softening	$16,035,000
Adsorptive Media	$12,446,000
Ion Exchange	$25,038,000
ABMet	$90,327,000

E. Estimate additional O & M cost ***(Citation)*****:**

See Burns & McDonnel report dated August 26, 2013 for detailed analysis.

Technology	Annual O&M
Coagulation/Filtration	$4,847,000
Lime Softening	$8,615,000
Adsorptive Media	$1,224,000
Ion Exchange	$12,207,000
ABMet	$1,968,000

F. Estimate the impact of treatment on the effluent substance concentration, and include any citations:

No technology supplier would guarantee their treatment technology would reliably treat to 0.2 ug/L of arsenic.

G. Identify any expected environmental impacts that would result from further treatment, and include any citations:

As mentioned, Lake Michigan arsenic levels already exceed 0.20 ug/L, so the installation of the treatment system would not have any impact on the levels of arsenic in Lake Michigan. It would create widespread, adverse financial impact on customers without any or very minimal environmental benefit. See *Arsenic Loads to Lake Michigan (June 2018)*. Furthermore, all of the treatment technologies investigated would result in additional waste disposal and increase in energy usage.

H. Is it technically and economically feasible for this permittee to modify the treatment process to reduce the level of the substance in the discharge? ☐ **Yes** ☒ **No** ☐ **Unknown**

Human caused conditions or sources of arsenic in Lake Michigan prevent the attainment of the standard and cannot be remedied. The most effective way to reduce the mass of arsenic discharged to Lake Michigan is by eliminating discharges containing arsenic, which is what the permittee is doing by reusing its LVWW in its air quality control system. However, as mentioned above, there are periodic operating scenarios where the wastewater cannot be reused and must be discharged. The Department believes the abandonment of the coal combustion residual ponds and reuse of wastewater is a beneficial environmental outcome.

I. If treatment is possible, is it possible to comply with the limits on the substance? ☐ **Yes** ☐ **No** ☒ **Unknown**

J. If yes, what prevents this from being done? Include any citations.

As mentioned above, the permittee's consultant (Burns & McDonnell) notes that it is difficult for these treatment technologies to meet the 0.2 ug/L limit because of the variability in the inlet arsenic concentrations and the lengthy delays associated with sending samples to a laboratory for analysis. Therefore, vendors are not willing to guarantee the performance of their arsenic removal technologies. Most of these treatment technologies were designed to meet the drinking water standard of 10 ug/L.

K. List any alternatives to current practices that have been considered, and why they have been rejected as a course of action, including any citations:

Arsenic is naturally occurring in both the ambient/intake water and fuel sources for the permittee. Source reduction efforts related to the intake water are not a feasible method for significant reduction of arsenic discharges from the plant for Unit 5, however Units 3 and 4 were retired which reduced intake from Lake Michigan. Note that municipal water is also from Lake Michigan and the resulting water quality of municipal water provided to the permittee is similar to the source water. With regard to coal, the permittee uses subbituminous coal which has the lowest average arsenic concentration of the various U.S. coals.

Section IX: Compliance with Water Quality Standards

A. Describe all activities that have been, and are being, conducted to reduce the discharge of the substance into the receiving stream. This may include existing treatments and controls, consumer education, promising centralized or remote treatment technologies, planned research, etc. Include any citations.

In its 2018 arsenic variance application update, the permittee submitted flow and arsenic sampling data to predict arsenic loading from Outfall 004. It is summarized in the table below. This was not performed for Outfall 009 because it was not anticipated that a variance would be needed at Outfall 009 (due to assumed eligibility for intake credits). As shown in the table below, the concentration at Outfall 004 is estimated to exceed the 0.2 ug/L Lake Michigan WQS for arsenic, but is within the range of measured arsenic concentrations in Lake Michigan at the water intake which ranged from 0.75 ug/L to 2.2 ug/L.

Stream	Flow Rate (gpm)	Arsenic Concentration (ug/L)	Mass Loading (lb/day)	Mass Loading (lb/year)	Average Concentration to 004 (ug/L)	Total Mass to 004 (lb/year)
Unit 5 Bottom Ash Sump[1]	2	0.99	0.00002	0.009	0.6778	1.8964
Unit 5 Boiler Room Sump	485	0.66	0.00386	1.408		
Unit 5 Condensate Polisher Sump	13	0.28	0.00004	0.016		
Unit 5 Demin Sump	1	0.28	0.0000	0.002		

Unit 5 Turbine Room Sump	67	0.74	0.00059	0.217		
Unit 4 Boiler Room Sump[2]	30	1.37	0.00049	0.180		
Coal Pile Runoff	40	0.37	0.00018	0.065		

[1] Flow is from the bottom ash unloading area sump, which may end up in the Unit 5 bottom ash sump despite a berm separating the two areas. The 2 gpm flow is not continuous. The area is swept/vacuumed, then may be rinsed with water, which is where the 2 gpm flow comes from.
[2] Although Unit 4 is retired, demineralization/condensate polisher system and basement waters are still collected in this sump.

- Unit 3 Retirement
  - Unit 3 was retired in 2013
  - This retirement reduced the overall flow to the WPDES Pond System through the elimination of LVWW such as slag sluicing, service water used for Unit 3 operations, and other wastewater associated with production of steam grade water.
  - This unit retirement reduced the withdrawal of water from Lake Michigan.

- Unit 4 Retirement
  - Unit 4 retired on September 30, 2018
  - This retirement reduced the overall flow to the WPDES Pond System through the elimination of LVWW such as slag sluicing, service water used for Unit 3 operations, and other wastewater associated with production of steam grade water.
  - This unit retirement reduced the withdrawal of water from Lake Michigan.

- Unit 5 Dry Bottom Ash Installation
  - This system is completely dry and replaces a 1985 Hydrobin system.

The operational changes and equipment installations reduced the overall arsenic concentration and mass discharged through Outfall 004 by 91% compared to baseline conditions when all three generating units were in operation. Refer to the October 23, 2018 submittal for more information.

- WPDES Pond Closures
  - With Units 3 and 4 retired and Unit 5 being equipped with a dry bottom ash handling system, operation of the ponds is no longer needed. The coal combustion residual ponds are scheduled to be abandoned in 2020.
  - As part of the abandonment and closure process, the existing wastewater stored in these ponds will need to be discharged via Outfall 004. However, once the ponds are abandoned in 2020, ash handling wastewater will not be discharged at Outfall 004.
  - An arsenic variance will still be needed for Outfall 004 post pond closure due to the existing coal pile runoff discharged through Outfall 004.

- Unit 5 Low Volume Wastewater
  - On June 5, 2019, the facility received construction approval to reconfigure its piping of low volume wastewater so it can be reused in the Unit 5 Air Quality Control System (AQCS), where it will be consumed. However, there are situations when the LVWW can't be used in the AQCS and must be discharged. This discharge contingency will discharge through Outfall 009.
  - Although a majority of the wastewater discharged through Outfall 009 is non-contact cooling water with arsenic levels dependent on concentrations in Lake Michigan, a variance will be needed for this outfall.

B. Describe all actions that the permit requires the permittee to complete during the variance period to ensure reasonable progress towards attainment of the water quality standard. Include any citations.

The proposed permit contains a variance to the water quality based effluent limit (WQBEL) for arsenic granted in accordance with s. 283.15, Wis. Stats. As conditions of this variance, the permittee shall (a) maintain effluent quality

at or below the effluent limitation specified, (b) implement the arsenic pollutant minimization measures specified in the Pollutant Minimization Plan, and (c) perform the actions listed in the schedule. (See the Schedules section of the permit). Here is a summary of the proposed permit requirements:

- Arsenic daily maximum limit of 5.1 ug/L at Outfall 004 with monthly monitoring
- Arsenic daily maximum limit of 2.5 ug/L at Outfall 009 with monthly monitoring
- Quarterly monitoring of arsenic at the Unit 5 surface water intake SP709.
- Requirement to notify DNR of CCR pond closure.
- Notification that the previously approved plan to reuse LVWW is the Unit 5 AQCS has been implemented.

Plans to close the CCR ponds and reuse LVWW in the Unit 5 AQCS are underway.

Section X: Compliance with Previous Permit *(Variance Reissuances Only)*

A. Date of previous submittal: Not applicable. **Date of EPA Approval:** Not applicable.

B. Previous Permit #: Not applicable. **Previous WQSTS #:** (EPA USE ONLY)

C. Effluent substance concentration: Not applicable. **Variance Limit:** Not applicable.

D. Target Value(s): Not applicable. **Achieved?** ☐ **Yes** ☐ **No** ☐ **Partial**

E. For renewals, list previous steps that were to be completed. Show whether these steps have been completed in compliance with the terms of the previous variance permit. Attach additional sheets if necessary.

Condition of Previous Variance	Compliance
Not applicable.	☐ **Yes** ☐ **No**